PAPERS AND PROCEEDINGS

OF

THE ROYAL SOCIETY OF TASMANIA

FOR THE YEAR

1946

Edited by
JOSEPH PEARSON
and
D. COLBRON PEARSE

PUBLISHED BY THE SOCIETY
The Tasmanian Museum and Art Gallery, Hobart

15.10.47

Price: Ten Shillings

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The Royal Society of Tasmania

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CONTENTS

Note on *Anthobothrium hickmani*, a new cestode from the Tasmanian electric ray (*Narcine tasmaniensis* Richardson)

By

PETER W. CROWCROFT

University of Tasmania

(Read 5th Nov., 1946)

(5 TEXT FIGURES)

The presence of Tetraphyllid cestode in the spiral valve of *Narcine tasmaniensis* was pointed out to me by Professor V. V. Hickman, who kindly made available a mount of a scolex and a number of proglottides collected by him some years ago. In April, 1945, two rays were examined for parasites. One contained one worm and the other two worms. The first specimen also yielded a single mobile free proglottid. No gravid proglottides were found. Three small specimens of the same ray examined in June, 1945, appeared free from the cestode.

The tape worm proves to be a hitherto undescribed species of the genus *Anthobothrium* van Ben., 1850. There does not appear to be any previous record of a species of this genus in Australian waters.

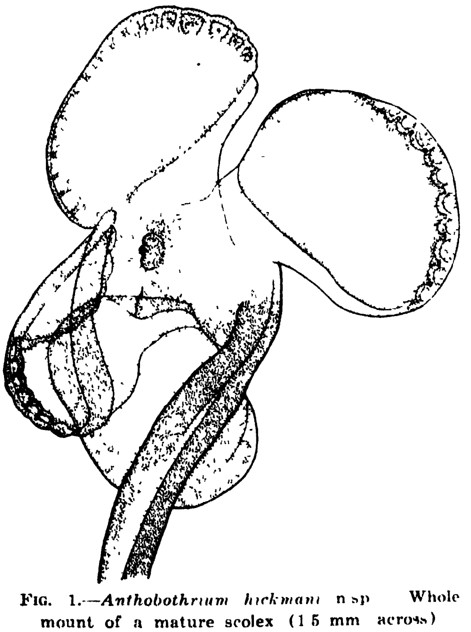

FIG. 1.—*Anthobothrium hickmani* n sp Whole mount of a mature scolex (1 5 mm across)

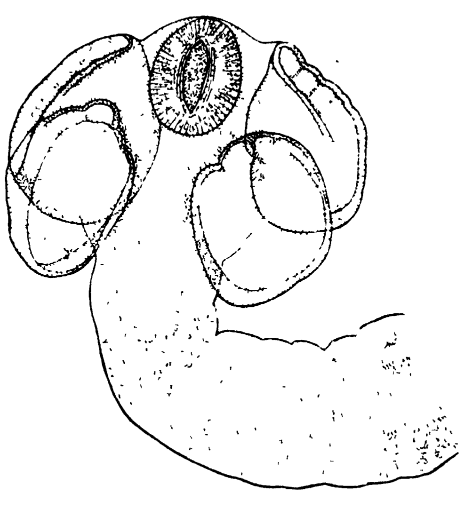

FIG 2 Whole mount of a less mature scolex than Fig 1 (0 6 mm.)

EXTERNAL FEATURES: SCOLEX

The scolex bears four simple pedunculate bothridia, two of which are dorsal and two ventral in position. Each bothridium has the form of a shallow cup, the outer edge of which is formed into a single row of shallow loculi. The form and proportions of the scolex vary with its age and with the degree of contraction of the bothridia. A mature expanded scolex is reminiscent in form of a four-leafed clover. The loculi are more readily seen in the living condition than in mounted material. They may extend completely around the margin of the bothridium or may be lacking from the proximal margin. In the youngest scolex collected, loculi are not in evidence (fig. 3). At the apex of the scolex there is a blunt elevated myzorhynchus which contains a well-developed sucker. In the young specimens whose bothridia do not possess well-developed loculi, this is quite similar to a typical Trematode acetabulum, but the mature scolex possesses a less distinctive structure. This would seem to indicate that a degeneration of the sucker accompanies the expansion and development of the bothridia.

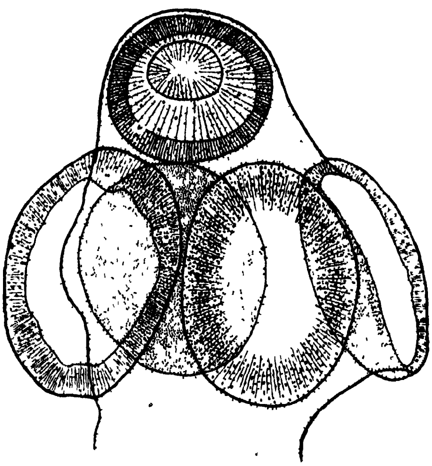

FIG. 3—Whole mount of a very young scolex (approx. 0·5 mm across).

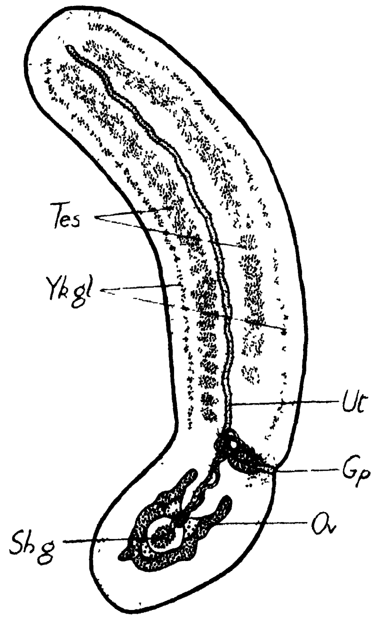

FIG. 4—Whole mount of a free mobile proglottid.

THE STROBILA

The scolex is followed by a short neck region in which no strobilation is visible. The length of the neck varies with the age and degree of contraction. The proximal proglottides are extremely short (fig. 2), but they become progressively more elongate until at the posterior end they measure 1·2 mm. long and 0·5 mm. wide. The longest worm collected comprised 105 distinguishable proglottides. The strobila is slightly flattened in transverse section and each proglottid is slightly constricted at the level of the genital pore, which is approximately ⅓ of its length in front of the posterior end. The genital pores are marginal and alternate irregularly. The proglottides may become free before fertilisation.

Genital System

Male: There are approximately 60 testes arranged in two single or double rows, lying on either side of the mid-line in the anterior two-thirds of the proglottid. They are somewhat compressed in the mounted specimens measuring approximately 0·6 mm. in diameter. The vas deferens describes several coils before entering the base of the cirrus sac. Within the sac it expands immediately into an unarmed muscular cirrus which runs directly through the sac to the genital atrium. The cirrus is composed of outer longitudinal and inner circular fibres. The sac is ovoid and measures 0·1 mm. long and 0·06 mm. in diameter. In sections of apparently fully-developed proglottides the wall of the sac is membranous and contains no distinct muscle fibres. The space within the sac not occupied by the cirrus is filled by the prostate gland. No distinct cells are visible the gland consisting of a matrix containing numerous small spherical nuclei. The genital atrium is a deep tubular depression 0·76 mm. long and 0·36 mm. in diameter which extends directly inwards from the genital pore to the outer end of the cirrus sac.

Female: The ovary is a U-shaped body which occupies the proglottid posterior to the genital pore. In transverse section the lateral arms of the U, which are directed forwards, are seen to be expanded dorsally and ventrally and constricted medially. Mid-way along their length the two lateral arms taper and come together into oviducts which fuse in the mid-line and pass into a fertilisation chamber A

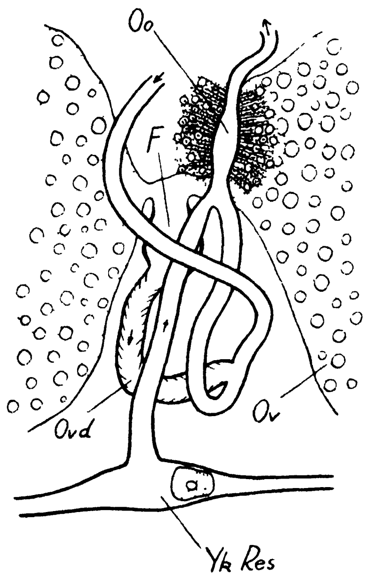

Fig. 5.—Diagram of female complex drawn from transverse sections.

transverse section through this region shows the dorsal and ventral lobes of the arms arranged in the form of an " X." The female duct runs directly ventrally from the fertilisation chamber as a wide ciliated tube. It fuses with the vagina, loses its ciliated lining, and runs dorsally to the level of its origin. Here it fuses with the central yolk duct and enters the shell gland. This is a compact ovoid mass containing numerous small nuclei, arranged radially about the ootype. Beyond

the shell gland the female duct passes into the uterus, which runs forward between the two rows of testes as a wide tube, and extends almost to the anterior end of the proglottid. The vitellaria are very numerous small follicles closely packed into two lateral rows, which extend from the anterior end of the proglottid to just in front of the genital pore. The yolk-collecting ducts from each side unite into a transverse reservoir below the central female complex. The central yolk duct runs directly dorsally from the reservoir to join the female duct. The terminal portion of the vagina lies beside the cirrus sac. It describes a convoluted path backwards between the ovary lobes and descends to enter the oviduct. Throughout its length it is surrounded by very numerous nuclei.

As no gravid specimens were obtained the eggs are not described. The gravid proglottides in the mount supplied by Professor Hickman show the usual shrinkage and distortion of the eggs. These specimens exhibit break-down of the organs of reproduction and expansion of the uterus into a large irregularly lobed sac occupying the whole of the proglottid in front of the genital pore.

Affinities

Anthobothrium hickmani differs from most species of the genus in the relatively simple form of the scolex. It seems most related to *Anthobothrium (Echeinobothrium) simplex* Shipley and Hornell from which it differs in the possession of a distinct myzorhynchus.

References

Southwell T., 1925.—A monograph on the *Tetraphyllidea*. *Liverpool School Trop. Med. Mem. N.S.* no. 2, 1925.

Abbreviations used in Text Figures

F, fertilisation chamber; *Gp*, genital pore; *Oo*, ootype; *Ov*, ovary; *Ovd*, oviduct; *Shg*, shell gland; *Tes*, testes; *Ut*, uterus; *Ykgl*, yolk glands; *YkRes*, yolk reservoir.

PAP. AND PROC. ROY. SOC. TASMANIA, 1946 (15TH OCTOBER, 1947)

Some digenetic trematodes from fishes of shallow Tasmanian waters

By

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(Read 5th November, 1946)

ABBREVIATIONS USED IN TEXT FIGURES

C, cirrus, *Cs*, cirrus sac, *Cut*, cuticle, *Ec*, ecsoma; *Esv*, external seminal vesicle, *Ex ap*, excretory aperture, *Ex v*, excretory vesicle, *Gc*, genital cone, *Gp*, genital pore, *Hd*, hermaphrodite duct; *Int*, intestine; *I sv*, internal seminal vesicle; *Lc*, Laurer's canal; *Oc*, ocular pigment; *Oo*, ootype, *Oes*, oesophagus, *OS*, oral sucker, *Ov*, ovary, *P gl*, prostate gland, *Ph*, pharynx, *Pp*, pars prostatica; *P ph*, prepharynx, *Rs*, receptaculum seminis; *R su*, receptaculum seminis uterinum, *Sh gl*, shell gland; *S ph*, sphincter, *Ss*, sinus sac, *Sv*, seminal vesicle, *Tes*, testis *Ut*, uterus *Vas d*, vas deferens, *VS*, ventral sucker or acetabulum; *Yk d*, yolk duct; *Yk gl*, volk gland, *Yk r*, volk reservoir

This contribution to our sparse knowledge of the helminth fauna of Tasmanian Fishes reports the presence of eight Trematodes, four of which are regarded as new. Apart from the taxonomic and morphological aspects, considerable interest accrues from a consideration of the significance of the presence of these particular species in Tasmanian waters.

Virtually nothing is known of the composition and distribution of the Trematode fauna of the fishes of the antarctic and southern temperate regions. Manter (1934) observes that many of the trematodes taken from deep-water fishes at Tortugas find their closest relatives in the fishes of Northern and far-distant waters rather in those of nearby shallow waters. Further, Manter remarks, 'It might even be found eventually that some species of trematodes have a continuous distribution from Arctic to Antarctic through deep-water hosts, although their shallow-water hosts might only appear in distant waters. Trematodes of the Antarctic are practically unknown and their comparison with deep-water forms of the tropics would be most interesting'.

The present paper, although limited in scope, bears out Manter's contention, e.g., *Helicometra fasciata*, herein reported from Tasmania, has been reported from both European and tropical waters. Again, *Hemiperina manteri* n.sp. finds its closest relative (*Hemiperina nicolli*) in deep waters at Tortugas, and the two members of the closely related genus *Hemipera* occur in British waters. *Derogenes crassus* has previously only been reported from deep waters at Tortugas. The occurrence of a new species of *Bivesicula* is of special interest as the three known species of this genus occur in Japanese waters. We may well expect the genus to have a continuous distribution from Northern to Southern hemispheres through the medium of deep-water tropical hosts.

Family ALLOCREADIIDAE

Sub-family *Allocreadiinae*

Helicometra fasciata (Rud.)

(Fig. 1)

Host: Neosebastes thetidis Waite.
Location in Host: Intestine, immediately beyond stomach.
Locality: Host obtained from Hobart fish market.
Frequency: Six specimens in one of six host fish examined. (March, 1945.)

Principal Dimensions

	Length mm.	Breadth mm.	Forebody mm.	Oral sucker mm.	Ventral sucker mm.	Eggs μ
1.	2·04	0·85	0·93	0·16	0·29	64 x 28
2.	2·49	1·09	0·99	0·19	0·36	88 x 28
3.	2·56	1·06	0·83	0·18	0·37	62-72 x 24
4.	2·79	1·08	1·11	0·19	0·36	72-88 x 24-28
5.	2·79	1·12	1·16	0·19	0·39	72-80 x 28-36
6.	3·63	1·45	1·58	0·28	0·46	88 x 28

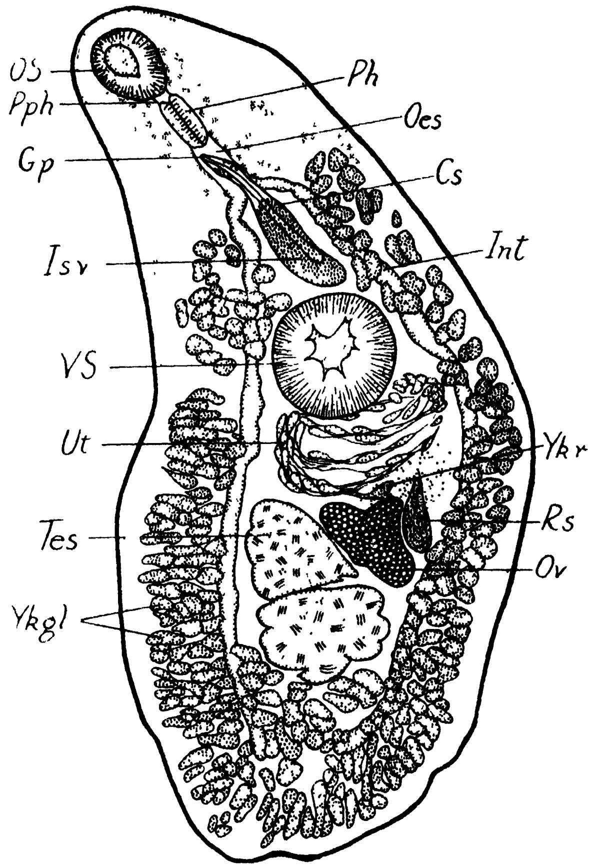

FIG. 1 *Helicometra fasciata*, whole mount from the ventral aspect.
(For abbreviations used on figures, see beginning of paper.)

Minor differences occur between these specimens and descriptions of forms taken from different fishes in other regions, but there seems every reason to include them in *H. fasciata*. This species is one of the most widely distributed of digenetic trematodes, having been previously reported from the Atlantic and Mediterranean Oceans, Tortugas, Florida, and Mexico. This is the first record of its occurrence in Southern waters. Its presence here is of interest as its occurrence is now known to be from distant Northern to Southern waters, in cold and in tropical seas over a wide range of longitude.

Helicometra bassensis Woolcock

(Fig. 2)

Host: Platycephalus bassensis.
Location in host: Intestine.
Locality: Derwent Estuary.
Frequency: Four specimens in one fish examined. (Feb., 1945.)

Principal Dimensions

	Length mm.	Breadth mm.	Forebody mm	Oral sucker mm.	Ventral sucker mm.	Eggs μ
1.	2·17	0·36	0·72	0·19	0·28	60 x 28
2.	2·25	0·51	0·47	0·21	0·34	56 x 28
3.	2·59	0·49	0·68	0·23	0·33	60 x 28
4.	3·31	0·56	0·83	0·24	0·37	60-70 x 28

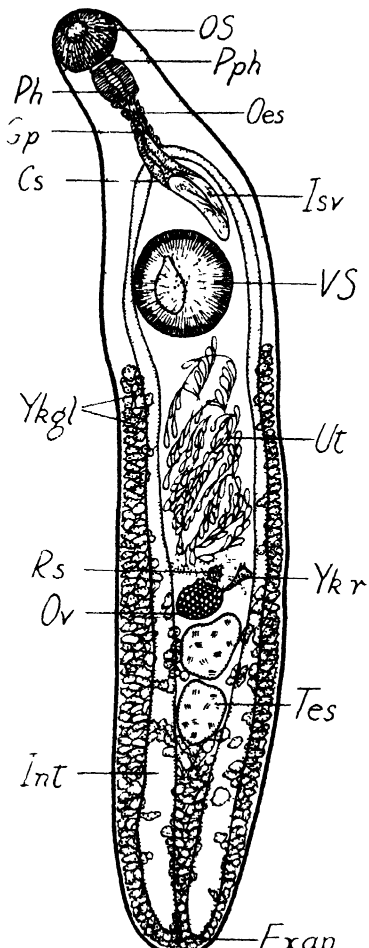

FIG. 2 – *Helicometra bassensis*, whole mount from the dorsal aspect.

There is no doubt that these trematodes represent *Helicometra bassensis*, but the specimens are worthy of note as the body is more slender and the testes are proportionately smaller than in Woolcock's specimens. The host is the same as that in which this species occurs in Victorian waters.

Family OPECOELIDAE

Sub-family *Opecoelinae*

Opecoelus tasmanicus n.sp.

(Figs 3-5)

Host: *Latridopsis forsteri* Castelnau.
Location in Host: Rectum.
Locality: Host obtained from Hobart fish market.
Frequency: Eight specimens from one of two hosts examined. (March, 1946.)

Principal Dimensions

	Length mm.	Breadth mm	Forebody mm.	Oral sucker mm.	Ventral sucker mm	Eggs μ
1.	2·74	0·86	0·73	0·24	0·39	—
2.	2·99	0·77	0·83	0·24	0·39	52 x 32
3.	3·34	0·86	1·06	0·27	0·42 x 0·39	60 x 32

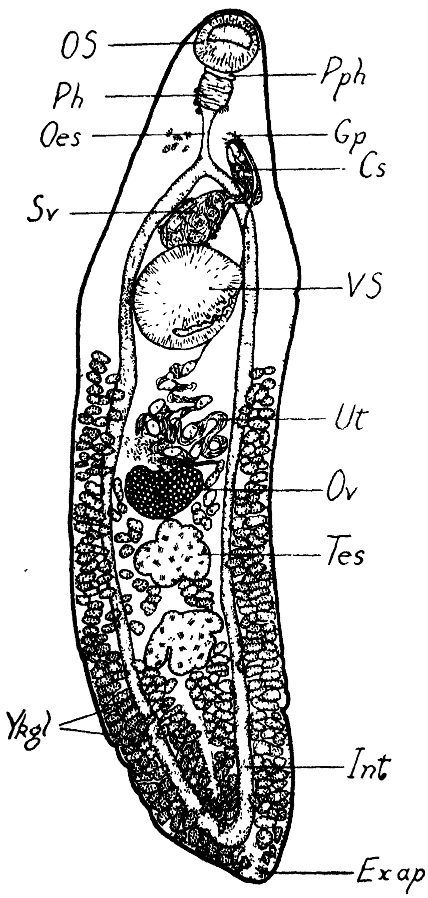

FIG. 3.—*Opecoelus tasmanicus*, n. sp., whole mount from the ventral aspect

External features: The elongate body is broadest at the level of the testes. It tapers sharply towards the anterior end and is bluntly roundly tapered posteriorly. In section the worms are quite flat. The oral sucker is sub-terminal and is not preceded by a lip. The ventral sucker is situated at the junction of the first and middle thirds of the body length. It is slightly elongated transversely and opens by a transverse aperture, the lips of which are produced into five or six blunt papillae. The ventral sucker is not pedunculate. In this respect it differs from most species of Opecoelus. The common genital aperture is situated to the left of the oesophagus mid-way between the pharynx and the intestinal fork. The excretory pore is at the posterior tip of the body. A further aperture, the anus, occurs on the ventral surface just anterior to the excretory pore. The cuticle is smooth and spineless.

Alimentary System: The oral sucker is separated from the pharynx by a short thin-walled prepharynx. The pharynx measures 0·14 mm. long by 0·09 mm. in diameter, and is followed by a muscular oesophagus leading to the intestinal fork. The cuticle does not appear to extend into the gut beyond the pharynx. The two rami diverge and run backwards on either side of the body some little distance from the lateral margins. Posteriorly they unite into a continuous arc which runs parallel with the posterior border of the body. A blunt caecum from the middle of the posterior arc passes backwards to meet an invagination of the body wall forming a connecting tube between the intestine and the anus. The gut wall lacks conspicuous muscle fibres and is lined throughout by a flattened epithelium containing numerous ovoid nuclei.

Excretory System: There is a median excretory bladder which extends forwards as far as the ovary, lying dorsal to the testes. Anteriorly the vessel gives off a pair of slender vessels which diverge and run forward below the gut rami into the neck region.

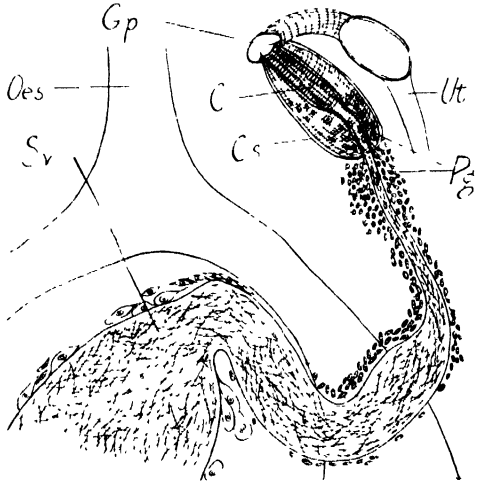

FIG. 4 —*Opecoelus tasmanicus*, n. sp., details of male terminal organs

Reproductive System: 1. *Male:*—The two testes are irregularly rounded lobed bodies lying one behind the other, between the rami, in the third quarter of the body length. They are elongated transversely and measure from 0·27 x 0·21 mm. to 0·52 x 0·39 mm. The anterior testis lies immediately behind the ovary and is

separated from the second by a short space which may be occupied to a more or less degree by yolk follicles. The vasa deferentia arise on the anterior borders of the testes and run forward above the ovary into the uterine region. They pass over the ventral sucker side by side and enter the base of the seminal vesicle. In the "in toto" mounts the vesicle lies obliquely in front of the ventral sucker, but in the contracted uncompressed specimens sectioned, the vesicle is seen to lie in the mid-line and to extend backwards for a considerable distance above the ventral sucker. The vesicle has the form of an elongated sac which tapers anteriorly as it crosses the left ramus of the gut and enters the cirrus sac. The size of the seminal vesicle varies greatly in different individuals. Very prominent gland cells which are highly vacuolate, are clustered about its thin wall. The cirrus sac measures about 0·14 mm. long and 0·06 mm. in diameter. It is quite muscular, possessing stout outer longitudinal and inner circular fibres. The tubular extension of the seminal vesicle lying within the sac leads into the pars prostatica. This portion of the male duct is short and is lined by the typical tall empty-looking cells. It receives the fine protoplasmic threads from the surrounding prostate gland which contains comparatively few darkly-staining nuclei and lies mainly outside the cirrus sac. The pars prostatica is followed by the terminal portion of the male duct approximately 0·05 mm. long which is slightly thickened and constitutes an unarmed cirrus. This leads into a short common genital atrium leading to the ventral surface.

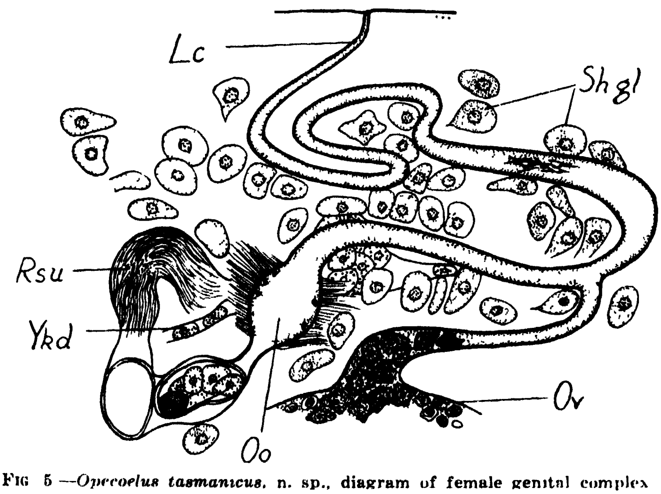

FIG 5.—*Opecoelus tasmanicus*, n. sp., diagram of female genital complex reconstructed from transverse sections

ii. *Female*:—The ovary is a compact kidney-shaped body lying directly in front of the anterior testis with its long axis directed transversely. In four "in toto" mounts the ovary measures approximately 0·30 x 0·15 mm. The oviduct leaves the ovary at the middle of its antero-dorsal surface, runs backwards and gives off Laurer's canal. This winds a sinuous course forwards and upwards and opens through the cuticle in the mid-line above the ovary. The canal contains masses of sperms in one specimen sectioned. After giving off Laurer's canal the oviduct expands into the ootype. This receives innumerable protoplasmic threads from the cells of the shell gland. The gland is well-developed and diffuse, extending right across the intercaecal space in front of the ovary. The gland cells are large and well defined, each containing a prominent nucleus and darkly-staining vacuolate cytoplasm. The female duct receives a short yolk duct from the yolk reservoir and

passes into the thin-walled uterus. Sperms may be present throughout the entire length of the uterus but the proximal loops consistently contain spermatic fluid and function as a receptaculum seminis. The convuluted uterus fills the intercaecal space between the ventral sucker and the ovary. It passes over the ventral sucker near the mid-line, and forwards along the left side of the seminal vesicle. The terminal portion of the uterus is muscular and may be distinguished as a metraterm. This opens into the common genital atrium in front of the male opening. The eggs are relatively large and thin-walled, possessing a circular operculum 12 μ in diameter. They are roundly ovoid in form and yellow in colour.

The vitellaria are small ovoid and irregularly formed follicles occupying the space between the lateral body margins and the gut rami. They are continued around the posterior arch of the gut and the intercaecal space in the vicinity of the ovary and the testes is largely filled by them. The yolk cells are collected by lateral yolk ducts which lie below the gut rami. Just in front of the ovary transverse ducts unite to form the central yolk reservoir. This tapers into a short duct which opens into the female duct. The vitellaria do not extend forwards beyond the posterior border of the ventral sucker.

Discussion: Opecoelus tasmanicus n.sp. seems most closely related to *O. mexicanus* Manter, from which it differs in its larger size and in the nature of the papillae of the ventral sucker. The seminal vesicle does not extend posterior to the ventral sucker in whole mounts and extended specimens. In this respect *O. tasmanicus* resembles those species placed in the genus Opegaster. However the vitellaria are entirely post-acetabular, and the glands present in the forebody do not appear to be concerned with the production of yolk. As Manter (1940) points out, the genera *Opecoelus* and *Opegaster* are very similar. It seems evident that the extent of the seminal vesicle and the vitellaria are unsatisfactory reasons for separating the genera. The tendency to raise minor differences to the rank of important diagnostic characters has long been exhibited by some writers on this group. The preferable course would seem to be the grouping of such similar species into one genus until such time as sufficiently clear sub-groups appear to warrant the setting up of several genera.

Family HEMIURIDAE

Sub-family *Derogenetinae*

Derogenes crassus Manter

(Figs 6-7)

Host: Physiculus barbartus Günther.

Location in Host: Gall bladder.

Locality: Hosts obtained from Hobart fish market.

Frequency: Seven specimens in one host (July, 1945). Absent from many hosts examined previously and since that date.

Principal Dimensions

	Length mm.	Breadth mm	Forebody mm.	Oral Sucker mm	Ventral Sucker mm.	Eggs μ
1.	3·44	1·12	1·50	0·37	0.81 x 0·75	64 x 28-32
2.	3·21	1·03	1·29	0·34	0 75 x 0 75	58-64 x 30-32
3.	2·85	0·93	1·17	0·34	0·67 x 0·67	60-64 x 28-32

The principal dimensions of three mounted specimens are given in the above table. The four remaining specimens were embedded and sectioned. Unfortunately the hard thick shells of the innumerable eggs which occupy most of the body prevented the preparation of successful serial sections.

Manter (1934) describes *Derogenes crassus* from a single mounted trematode which he regards as presenting sufficient differences from known species to warrant the formation of a new one. The present specimens are slightly larger than Manter's specimen but resemble it closely in proportion, the disposition of the internal organs and in the size of the eggs. There appears to be a difference in the form of the vitellaria, those of my specimens being roundly lobed, while those of Manter's specimen are described as compact and unlobed.

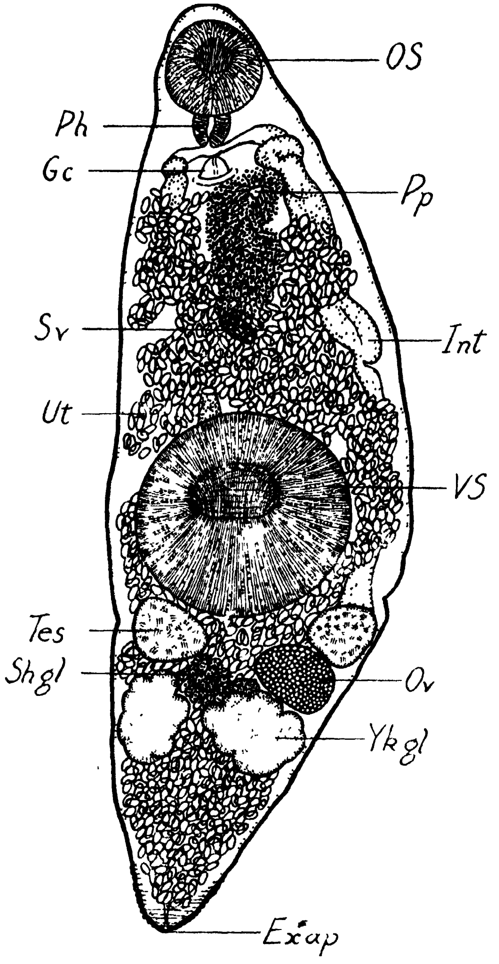

FIG 6.- *Derogenes crassus*, whole mount from the ventral aspect

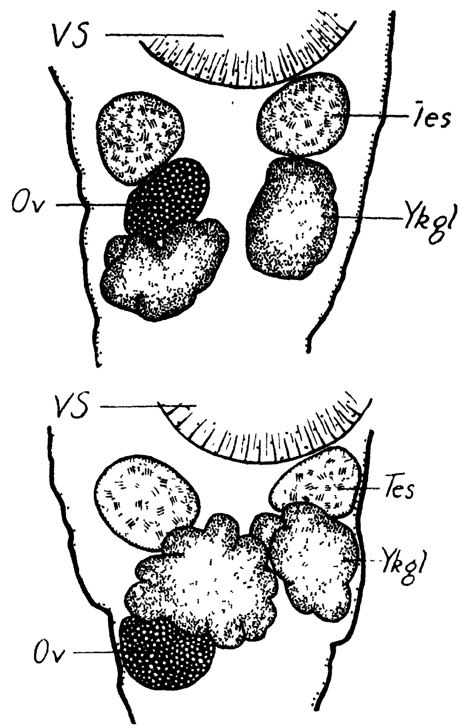

FIG 7 *Derogenes crassus*, sex glands of two specimens, both from the ventral aspect.

It is possible that a more detailed examination of the deep-water form from Tortugas, and of the Tasmanian form may reveal specific differences, but in view of the inadequate material available it seems quite advisable to include my specimens in *Derogenes crassus*. Slight displacement of the organs often occurs in the mounting of stout trematodes. This accounts for the variation in the relative positions of the ovary and vitellaria shown by the three mounted specimens (Fig. 7). The occurrence of the ovary on the left side in one specimen may not be due to displacement, but may represent a variation within the species.

Sub-family *Hemiurinae*

Parahemiurus lovettiae n.sp.

(Figs 8-9)

Host: ***Lovettia sealii*** **Johnston (" White Bait ").**
Location in Host: **Intestine.**
Locality: **Huon Estuary.**
Frequency: **One to three specimens in four of twelve hosts examined.**

Principal Dimensions

	Length	Breadth	Fore-body	Oral Sucker	Aceta-bulum	Testes	Ovary	Eggs
	mm.	mm.	mm.	mm.	mm.	mm.	mm.	μ
1.	1·21 + 0·25	0·29	0·18	0·08	0·15	0·13 x 0·098	0·13 x 0·08	20 x 8
2.	1·19 + 0·23	0·36	0·28	0·08	0·15	0·13 x 0·098	0·15 x 0·08	20 x 8
3.	1·27	0·39	0·16	0·08	0·15	0·098	0·114 x 0·065	20 x 8
4.	0·85 + 0·34	0·285	0·17	0·089	0·15	0·08	0·098 x 0·065	20 x 8
5.	0·91 + 0·23	0·28	0·10	0·08	0·15	0·114	0·13 x 0·08	21 x 9

External features: The body is slender and cylindrical, tapering towards the anterior end. Posteriorly the body is produced into a tapered " tail " or ecsoma, which is capable of complete withdrawal into the body. The ecsoma makes up approximately a quarter of the animal's total length. The oral sucker is terminal, its aperture being only slightly directed towards the ventral surface. The ventral sucker is situated approximately at the junction of the first and second fifths of the body length. The ratio between the suckers is 1 : 1·875. The excretory pore is at the tip of the ecsoma. The cuticle is produced into the prominent rings or plications, characteristic of the group. They extend laterally and ventrally for the full length of the soma, becoming gradually more separated towards the posterior end. They do not extend to the ecsoma. Dorsally the plications extend completely across the body beyond the level of the ventral sucker, but appear to be lacking beyond the level of the anterior testis.

Alimentary System: The oral sucker opens directly into the pharynx. This is spherical and measures 0·05 mm. in diameter. The pharynx leads into a globular muscular oesophagus or oesophageal pouch. Posteriorly the wall of the oesophagus is thickened to form a sphincter through which the oesophagus communicates with the two gut rami. The proximal portions of the rami are unlined and run directly transversely. The rami then turn sharply backwards and expand into thin-walled sinuous tubes, which are lined by an epithelium of closely-packed tall cells with basal nuclei. The cuticle does not appear to extend into the gut beyond the pharynx. The rami continue backwards lying dorsal to the ovary and vitellaria and enter the ecsoma, in some cases extending almost to the tip of the tail. The gut wall is very weakly muscular.

Excretory System: This species presents no variation from the typical system of the family. A single tubular vesicle penetrates the ecsoma and bifurcates approximately at the level of the testes. The branches diverge and pass forwards end towards the dorsal surface, fusing to form a continuous loop above the pharynx.

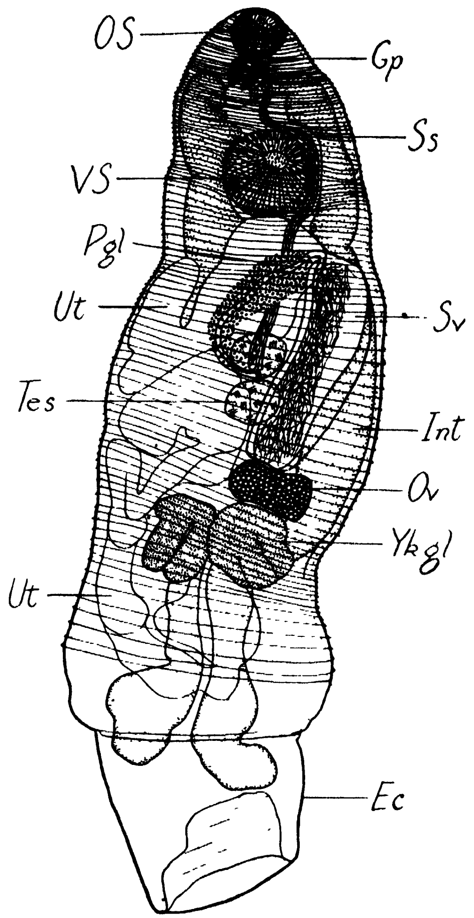

FIG. 8.—*Parahemiurus lovettiae*, n. sp., whole mount from the ventral aspect

Reproductive System. i. *Male*:—The two testes are ovoid unlobed bodies lying directly or slightly obliquely in tandem in the middle region of the body. In all specimens examined the testes are in contact, never separated by loops of the uterus. The relative size of the testes varies somewhat in different individuals but they are always smaller than the ventral sucker and in most specimens, smaller than the ovary. The vasa deferentia are very short as they pass directly to the base of the seminal vesicle which may be to the right of the testes or directly dorsal to them. The vesicle is a large spindle-shaped muscular sac which extends obliquely forwards from the vicinity of the posterior testis to a point mid-way between the anterior testis and the ventral sucker, or almost to the posterior border of the latter. The seminal vesicle measures 0·2-0·3 mm. in length and 0·05-0·08 mm. in diameter at its middle length. The wall is extremely thick, the lumen measuring 0·032 mm. in diameter in the transverse section of a vesicle 0·08 mm. in diameter. As is the case in the other species placed in this genus the lumen is undivided. At its anterior extremity the vesicle tapers into a slender muscular duct which turns backwards and expands slightly forming a long pars prostatica 0·022 mm. in

diameter. The prostate gland consists of numerous individual small vacuolate cells which have prominent nuclei, clustered uniformly around the pars prostatica throughout its length. The prostate cells are not enclosed by any limiting membrane, and they become sparser posteriorly finally petering out. The male duct then meets and fuses with the narrow terminal portion of the female duct, forming the long narrow hermaphrodite duct which passes directly forwards over the ventral sucker, through the neck region to the genital pore. Throughout its entire length the duct is enclosed by a strongly muscular sinus sac which is separated from the duct by a narrow space. It seems certain that the terminal portion of the hermaphrodite duct functions as the copulatory organ, as Woolcock (1935) observes in the case of *P. australis*.

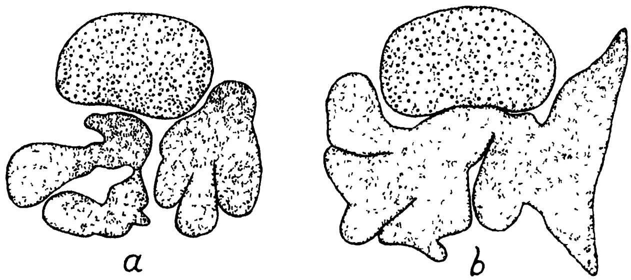

FIG. 9—*Parahemiurus lovettiae*, n. sp., female glands of two specimens, "a" ventral view, "b" dorsal view

ii. *Female:* The ovary is a smooth ovoid body situated towards the left side of the animal mid-way between the ventral sucker and the posterior end of the soma. In most specimens it is in contact with the posterior testis but it may be separated from that organ by loops of the extensive uterus. The ripe egg-cells measure 8 μ in diameter. The vitellaria are two adjacent lobed bodies lying immediately behind the ovary. In form they may be roundly bilobed or somewhat more divided (Fig. 9). The material is not favourable for the detailed examination of the course of the oviduct and vitelline ducts. However, the ootype lies immediately behind the ovary in a position dorsal to the vitellaria, and is surrounded by small cells with densely-staining contents, which constitute the shell gland. A small receptaculum seminis is present beside the shell gland. The uterus runs back into the ecsoma and then turns forward and fills most of the body spaces behind the ventral sucker. It is voluminous and contains very numerous elongate-ovoid eggs, which are light-brown in colour. The uterus narrows abruptly before fusing with the male duct to form the hermaphrodite duct or genital sinus.

Discussion: Since the genus *Parahemiurus* was erected by Vaz & Pereira (1930), with *P. parahemiurus* as the type, ten species have been added. Of these Manter (1940) recognizes only six, regarding *P. parahemiurus*, *P. platichthyi*, *P. atherinae*, and *P. harengulae* as synonyms of *P. merus* (Linton), and retaining *P. merus*, *P. australis*, *P. anchoviae*, *P. sardinae*, *P. seriolae*, and *P. ecuadori*. The species described above closely resembles *P. australis* in the form and proportions of the body, in the shape of the seminal vesicle, which in this species at least, does not appear to be variable, and in the size of the eggs. However, the body and all organs are markedly smaller and it differs from *P. australis* in the greater extent of the plications of the cuticle. The diagnostic value of the latter character is

generally accepted, but it is sometimes difficult to ascertain the extent with certainty and published descriptions are not always clear on this point. Until workers are agreed on the relative diagnostic importance of morphological characters in the Trematoda, and until the extent of the effects of different hosts and conditions upon a species are understood, the recognition of individual species of *Parahemiurus* will remain controversial. However, there is a sufficiently clear group of related species with sufficiently marked individual differences to ensure the survival of this genus.

Parahemiurus australis Woolcock

(Fig. 10)

In a previous paper (Crowcroft, 1946), the writer pointed out the presence of a Hemiurid which appeared to be *Parahemiurus australis*, in the stomach of the 'Rock Cod', *Physiculus barbartus* Günther. The principal dimensions of the specimens are given here for purposes of comparision with those of the preceding species. An illustration of a whole mount is given for the convenience of local students.

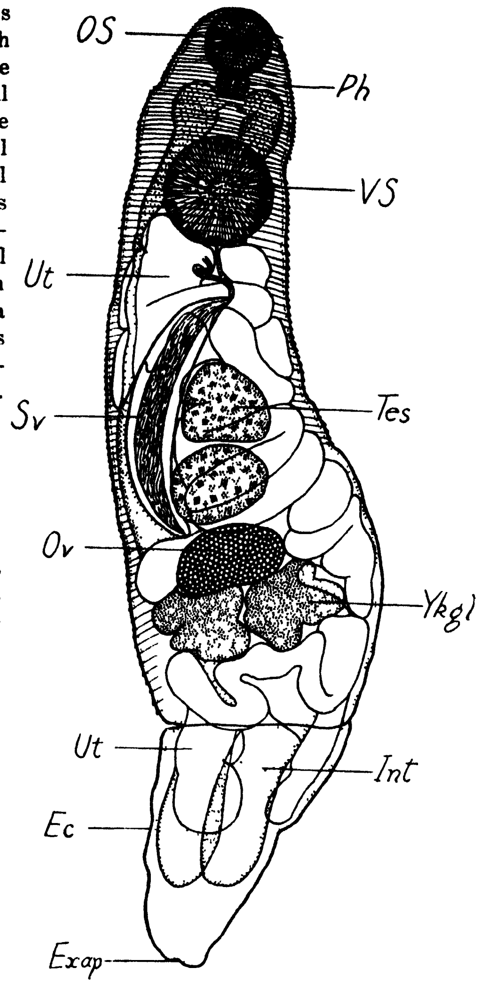

FIG. 10. *Parahemiurus australis*, whole mount from the dorsal aspect

Principal Dimensions

	Length	Breadth	Fore-body	Oral Sucker	Acetabulum	Testes	Ovary	Eg.
	mm.	mm.	mm.	mm.	mm.	mm.	mm.	μ
1.	1·83 + 0·44	0·51	0·29	0·15	0·28	0·23 x 0·15	0·28 x 0·13	20 x 8
2.	1·68 + 0·52	0·72	0·34	0·18	0·32	0·18 x 0·11	0·26 x 0·15	24 x 8
3.	1.66 + 0·41	0·52	0·39	0·18	0·29	0·19 x 0·11	0·26 x 0·13	20 x 8
4.	1·55 + 0·42	0·46	0·29	0·13	0·24	0·13	0·20 x 0·12	22 x 6
5.	1·38 + 0·52	0·54	0·27	0·16	0·25	0·23 x 0·16	0·24 x 0·13	22 x 8

Hemiperina manteri n.sp.

(Figs 11-12)

Hosts: 1. *Latridopsis forsteri* Castelnau ("Bastard trumpeter").
2. *Cheilodactylus spectabilis* Hutton ("Carp").

Location in Host: Stomach.

Locality: Hosts obtained from Hobart fish market.

Frequency: Twenty-one specimens in the first host and two specimens in the second. (March, 1946.)

External features: The body is elongate, and almost round in section being only slightly flattened ventrally. The thick cuticle is unspined and smooth. The body is broadest at the level of the ventral sucker which is situated at the junction of the second and last thirds of the body length. In front of the ventral sucker the body tapers gradually to the bluntly rounded anterior end. Posteriorly the body tapers strongly. The oral sucker is surmounted by a fleshy pre-oral lip. The principal dimensions of nine mounted specimens are given in the following table. Specimens 5 and 6 are those taken from the second host mentioned above.

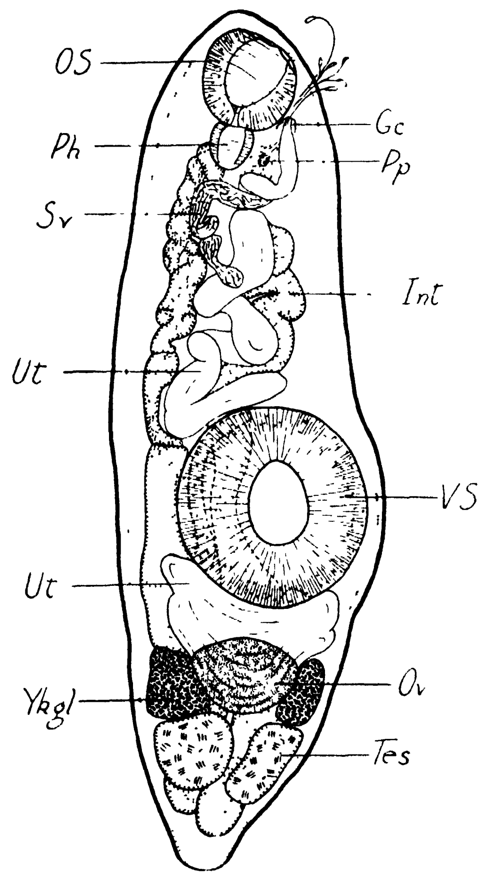

FIG. 11.—*Hemiperina manteri*, n. sp., whole m- from the ventral aspect.

Principal Dimensions

	Length	Breadth	Forebody	Oral Sucker	Ventral Sucker	Eggs
	mm.	mm.	mm.	mm.	mm.	μ
1.	2·07	0·68	0·93	0·24	0·50	32 x 12
2.	2·10	0·79	1·03	0·24	0·46	32 x 12
3.	2·23	0·64	1·08	0·26	0·46	32 x 12
4.	2·44	0·81	1·11	0·29	0·62	32 x 12
5.	2·51	0·81	1·16	0·27	0·52	32 x 12
6.	2.62	0·81	1·45	0·29	0·55	32 x 12
7.	2·62	0·83	1·24	0·29	0·60	36 x 12
8.	2·67	0·78	1·35	0·31	0·59	32 x 12
9.	3·01	0·70	1·47	0·28	0·55	40 x 8-12

The common genital aperture is situated at the end of a protusible genital cone, which is median in position, a short distance behind the oral sucker. The excretory aperture is a simple pore at the posterior extremity.

Digestive System: The oral sucker is applied to the pharynx postero-dorsally, a prepharynx being absent. The pharynx is slightly longer than its diameter, measuring 0·114 mm. x 0·08 mm. Posteriorly it opens into a short oesophagus whose wall is thinly muscular consisting of inner circular and outer longitudinal fibres. At its junction with the pharynx, the oesophagus is narrow but it rapidly expands into the oesophageal pouch frequently seen in this family. The oral sucker, pharynx and oesophagus are lined by an internal extension of the cuticle. The gut rami arise from the dorsal wall of the oesophageal pouch. A proximal portion of each ramus is smooth and unlined and runs directly outwards from its origin. The rami then turn backwards and pass through the long forebody. They lie some distance from the body margins and enclose the uterus. They pass over the ventral sucker lying closely together, diverge behind that organ to encompass the shell gland and continue backwards side by side almost to the posterior end of the body. Throughout their length the rami are lined by large collumnar cells containing prominent nuclei. These cells are somewhat separated from one another and impart a speckled appearance to the rami of the stained " in toto " mounts. The actual wall of the gut is membranous and apparently lacks distinct muscle fibres.

Excretory System: The posterior, single median portion of the excretory vesicle is quite short bifurcating behind the level of the vitellaria. The two arms run forward side by side to about the level of the ovary. They then diverge and come to lie beneath the gut rami. In this position the paired canals run forward throughout the forebody. Anteriorly they pass towards the dorsal surface and are seen to be continuous with one another above the pharynx.

Reproductive System: i. *Male.*—There are two roundly triangular entire testes lying almost side by side in the posterior fifth of the body. In specimens 5 and 6 of the above table the testes measured 0·26 x 0·21 and 0·13 x 0·24 and 0·19 x 0·29 respectively, but they were either lacking or partially disintegrated in the specimens taken from *Latridopsis forsteri*. The testes lie immediately behind the vitellaria, and when fully developed their posterior border is but a short distance in front of the termination of the gut rami. The fine vasa deferentia were not completely traced forwards but were seen to unite at the base of the seminal vesicle mid-way between the suckers. The seminal vesicle takes the form of a sinuous tube 0·05 mm. in diameter which runs forward almost to the bifurcation of the gut. Its wall is membranous and contains widely-scattered flattened nuclei. At its anterior end the vesicle narrows abruptly into a duct which runs forward and downwards and opens through a sphincter into the pars prostatica. This measures 0.018 mm. in

diameter. The lumen is very narrow due to the lining of tall empty-looking cells. The pars prostatica and the narrow portion of the seminal vesicle leading to it are surrounded by the numerous cells which constitute the well-developed diffuse prostate gland. Fine protoplasmic threads radiate backwards and outwards from the wall of the pars prostatica to the vacuolate prostate cells. The pars narrows and passes through the somewhat diffuse meridional muscles which must be regarded as constituting a sinus-sac. The typical prostatic lining is lost and when the male duct penetrates as far as the centre of the sinus-sac, it receives the metraterm posteriorly, forming the genital sinus or hermaphrodite duct. The sinus-sac measures 0·068 mm. in diameter and appears to be responsible for the eversion of the genital cone through which the hermaphrodite duct passes to the genital aperture situated at its extremity.

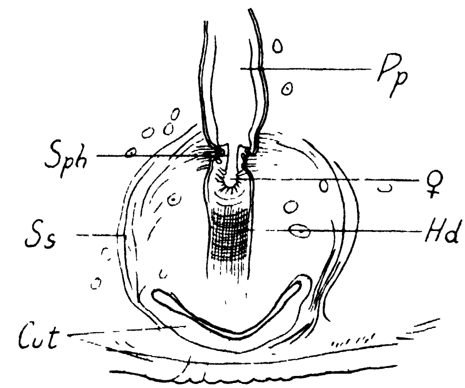

FIG. 12 *Hemiperina manteri*, n. sp., portion of a transverse section showing junction of male and female ducts.

ii. *Female:* The ovary is situated a short distance in front of the testes in a median position. It is globular and in specimens mounted under cover-glass pressure appears transversely elongated measuring 0·098-0·19 x 0·16-0·29 mm. The nuclei in the ovary measure 0·008 mm. in diameter. Dorsally the ovary passes into a narrow oviduct which runs directly dorsal for a short distance. It then turns abruptly and receives Laurer's canal. This runs forward sinuously for a short distance and opens on the dorsal surface, in the mid-line. The canal is slightly dilated a short distance from its origin and may function as a receptaculum seminis. Laurer's canal measures 0·015 mm. in diameter but is lined by a thick non-staining layer which leaves only a narrow lumen. A very short distance from its junction with Laurer's canal the oviduct receives a short narrow yolk duct from the central yolk reservoir, and enters the compact shell gland. The latter is globular and measures 0·09 mm. in diameter. The numerous cells of the gland display abundant contents and prominent nuclei. Within the shell gland the female duct runs backwards, describes a complete turn and runs antero-ventrally as the ootype.

The vitelline glands are two entire ovoid bodies lying on either side of the ovary and extending slightly beyond that organ posteriorly. They are approximately equal in size measuring about 0·16 x 0·11 mm. and vary only slightly in form in the mounted specimens. The glands are bounded by thin membranous

walls and are loosely packed with yolk cells. The cells contain yolk particles and large spherical nuclei each with a single prominent nucleolus. A yolk duct leaves each gland on its innermost surface and runs obliquely dorsally between the ovary and the gut. They unite into a fairly large yolk reservoir dorsal to the ovary and immediately behind the origin of the oviduct.

After leaving the shell gland the female duct expands slightly into the uterus. This describes many loops and below and in front of the ovary forms a compact mass which extends forward to the ventral sucker. The uterus then passes over the ventral sucker between the gut rami and describes a helical spiralled course to the level of the prostate gland. Here it narrows into a muscular metraterm 0·028 mm. in diameter which runs forwards and downwards and penetrates the sinus-sac. It opens through a stout sphincter into the common genital sinus which measures 0·024 mm. in diameter and 0·06 mm. long when the genital cone is retracted. The first loops of the uterus contain numerous sperms and function as a uterine seminal receptacle.

The innumerable eggs are light-brown in colour. They are elongate, bearing a bluntly-rounded operculum in front and at the other end tapering into a very long slender filament which is many times longer than the body of the egg.

Discussion: The genus Hemiperina was set up by Manter (1934) for a single species, *Hemiperina nicolli.* Manter did not include this species in the genus *Hemipera* Nicoll "because of the evident lack of a cirrus sac, absence of a seminal receptacle, better prostate gland and much smaller eggs." The species described above is identical in size with *Hemiperina nicolli* and closely resembles it in structure, The chief differences are in the form of the seminal vesicle and the presence in *Hemiperina manteri* of a weakly-developed sinus-sac. The genus *Hemipera* Nicoll contains two species *H. ovocaudata* Nicoll and *H. sharpei* Jones. The four allied species are compared in the following table:—

	Hemipera ovocaudata	*H. sharpei*	*Hemiperina nicolli*	*H manteri*
Host	*Lepadogaster gounnan*	*Cepola rubescens*	*Chaunax nuttingi Diplacanthopoma brachysoma Dibranchus atlanticus*	*Latridopsis forsteri Cheilodactylus spectabilis*
Location in Host	Stomach	Under Gill-cover	Stomach	Stomach
Length mm.	1·54 x 0 56	4 77 x 0·85	2·07-3 13 x 0 72-0·87	2·07-3·01 x 0 68-0·83
Oral Sucker	0·22 mm	0·37 mm.	ratio 2 : 3 or 3 : 4	0·21-0 31 mm.
Ventral Sucker	0·4 mm.	0·74 mm		0·46-0 62 mm
Termination of male duct	Cirrus-sac present containing prostate gland. Vesicula seminalis externa present	Cirrus-sac present, probably contains prostate gland, and seminal vesicle	Cirrus-sac absent Well-developed free prostate gland and seminal ves present. Vesicle sac-shaped and muscular	Sinus-sac weakly developed. Well-developed free prostate gland and seminal ves. present. Ves. tubular, thin-walled
Female Complex	No distinct receptaculum sem. Laurer's canal 'apparently absent'	Prominent receptac. sem present. Laurer's canal present	Receptac. sem uterinum present. Laurer's canal not described	Receptac. sem. uterinum present. Laurer's canal present
Eggs μ	100 x 27 with short filaments	100 x 38 with filaments about 11 times egg length	44-52 x 16-20 with filaments at least 20 times egg length	32-40 x 8-12 with filaments at least 20 times egg length

Although a weakly-developed sinus-sac is present in *Hemiperina manteri* this structure does not correspond to the cirrus-sac of *Hemipera* but is parallel rather with the sinus-sac of *Theletrum.* The generic diagnosis of *Hemiperina* must therefore be amended to include forms in which a sinus-sac is in evidence.

Family BIVESICULIDAE

Bivesicula australis n.sp.

(Figs 13-15)

Host: Neosebastes thetidis Waite.

Location in Host: Intestine, near stomach.

Locality: Hosts obtained from Hobart fish market.

Frequency: One in each of three hosts, two in one host, absent from four others examined (December, 1944; March, 1945).

Principal Dimensions

	Length mm.	Breadth mm.	Oral Sucker mm	Ovary mm	Testis mm	Eggs μ
1.	1·59	0·62	0·15	0·15	0·24 x 0·29	84 x 48
2.	2·51	1·04	0·31	0·13 x 0·16	0·41	60 x 44
3.	2·54	1·17	0·26	0·19	0·39 x 0·41	72 x 48

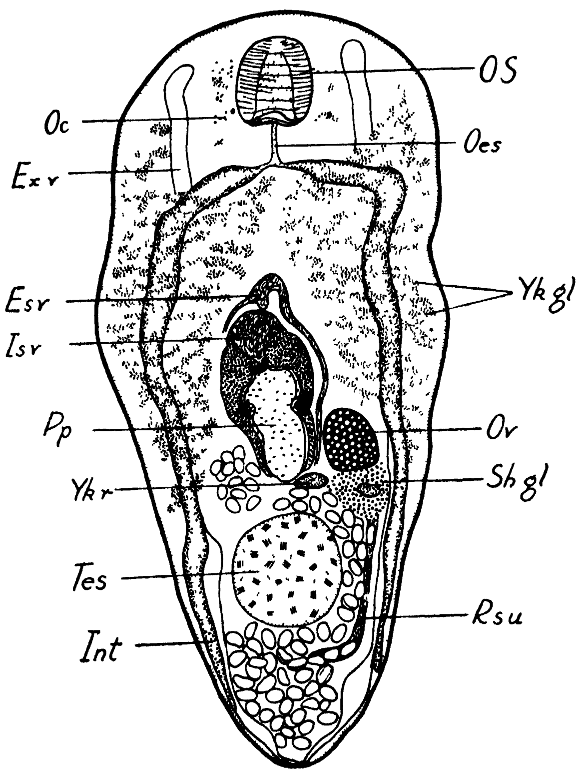

FIG. 13.—*Bivesicular australis*, n sp, contracted whole mount from the dorsal aspect.

External Features: The small, highly-contractile trematodes, appear fusiform in the extended state, but when contracted they are clavate, tapering from before backwards. The oral sucker is funnel-shaped, and is terminal in position. It may be completely withdrawn into the body and in this position it communicates with the exterior through a ventral invagination of the body wall. No acetabulum is present.

The cuticle is thick and towards the front end of the animal is armed with extremely minute spinules. Numerous blindly terminating tubules occur around the border of the oral sucker and for some distance posterior to that organ. These tubules are quite similar to those described by Woolcock (1935) from ***Helicometra tenuifolia***. As in that species the tubules are probably excretory in function. The genital pore is situated on the ventral surface in the mid-line, at the junction of the middle and last thirds of the body. The excretory pore is at the posterior extremity. The worms are 'ocular', an area containing pigment granules occurring on either side of the oesophagus.

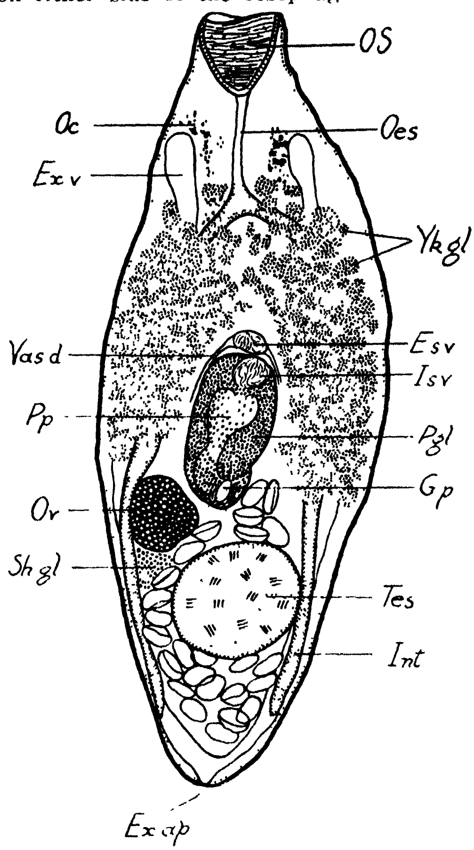

FIG. 14.—*Bivesicula australis*, n. sp., extended whole mount from the ventral aspect.

Alimentary System. The oral sucker opens directly into the oesophagus, a distinct pharynx being absent. The oesophagus is narrow and its length varies greatly according to the state of contraction of the specimen. When contracted its wall is strongly muscular possessing stout inner circular and outer longitudinal fibres. Posteriorly the oesophagus opens into the gut rami, which diverge sharply and come to lie close to the body margins. The rami extend backwards almost to the posterior extremity of the body, as smooth sinuous tubes, uniformly round or oval in section and tapering considerably towards their extremities. The walls of the rami are membranous and lined by a flattened epithelium containing very numerous ovoid nuclei.

Excretory System: Paired excretory vesicles fuse immediately in front of the excretory pore. They extend forwards from this point as greatly distendable tubes which pass forwards on either of the testis, lying below the gut. Anterior to the testis they narrow and pass between the gut rami and the cirrus-sac. In front of the cirrus-sac they pass between the converging gut rami, and occupy the bulk of the lateral regions of the body. In contracted specimens the vesicles appear to terminate in front of the posterior border of the oral sucker, but when the animal is normally extended they do not reach the level of that organ. The walls of the excretory vesicles are membranous, containing widely-separated nuclei.

Reproductive System: i. *Male.*—The single large testis is median, lying in the intercaecal space in the posterior third of the body. It is circular or roundly oval in outline and flattened dorso-ventrally. The testis is bounded by a membranous wall containing flattened nuclei. Two vasa deferentia arise from the anterior border of the testis, and run forward along the right and left sides of the cirrus-sac. The cirrus-sac is a relatively large cylindrical structure which measures 0·33 mm. in diameter, and 0·65 mm. long in the largest specimen. It occupies the middle third of the body length and lies in the mid-line entirely in front of the genital pore. Its wall is strongly muscular, consisting of stout inner circular and outer longitudinal fibres. The vasa deferentia expand and fuse into a small 'external' seminal sevicle which lies at the anterior end of the cirrus-sac. This vesicle communicates with an 'internal' seminal vesicle within the cirrus-sac, by means of a fine duct.

The 'internal' seminal vesicle possesses a weakly muscular wall and is almost spherical in form. It narrows abruptly into a short muscular duct surrounded by a sphincter. This duct leads into the pars prostatica, which occupies most of the volume of the cirrus-sac. The wall of the pars is thick, being composed of stout outer longitudinal and inner circular fibres. It is lined by the typical empty-looking cells, which are relatively tall. The musculature and the epithelium are more strongly developed along one side producing a prominent ridge which projects into the lumen. Anteriorly the pars is produced into two lateral pouches, one of which extends forwards on either side of the internal seminal vesicle. The remaining space within the cirrus-sac is occupied by the well-developed prostate gland. This consists of a matrix in which numerous ovoid nuclei are embedded. The nuclei are densely arranged in an outer zone near the sac wall, leaving an inner clear zone surrounding the pars prostatica which consists of radiating protoplasmic strands. A short distance in front of the posterior end of the cirrus-sac the pars prostatica passes through the ventral wall of the sac and opens into the common genital atrium.

ii. *Female.*—The ovary is a smooth spherical or ovoid body lying on the right side of the body at the level of the genital aperture or slightly in front of that level. Topographically it lies between the right ramus of the gut and the hind end of the cirrus-sac, and towards the dorsal surface. The ripe egg-cells measure 12 μ in diameter. Postero-ventrally the ovary tapers into a wide muscular oviduct. This runs backwards and expands, directly behind the ovary, into the ootype. Laurer's canal is given off approximately at the middle length of the oviduct. The canal, which is very narrow, winds a sinuous course to a minute pore in the cuticle in the mid-line at the level of the anterior border of the testis. The ootype is surrounded by a large compact shell gland which consists of a vacuolate matrix through which numerous nuclei are uniformly distributed. Individual cell boundaries are not distinguishable.

The yolk follicles are numerous small irregular bodies filling the body from the level of the genital atrium to the level of the middle of the oesophagus. In a small mounted specimen (Fig. 14), the follicles are more uniform and display a greater degree of independence than in the larger specimens. The follicles of

the latter have a tendency to fusion (Fig. 13). The yolk is collected into a transversely elongated reservoir which lies on the left side of the shell gland. A duct from the reservoir opens into the oviduct as it enters the shell gland.

The uterus passes directly backwards on the right side lying near the dorsal surface, and fills the body behind the testis. The proximal descending portion of the uterus functions as a receptaculum seminis uterinum. After describing two or three loops behind the testis the uterus passes forwards beside its proximal portion and crosses the body in front of the testis. It describes a loop to the left side of the cirrus-sac before narrowing abruptly into a muscular metraterm

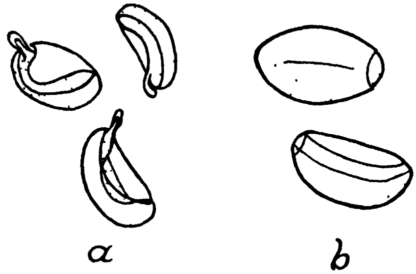

FIG. 15.—*Bivesicula australis*, n. sp., "a" eggs with polar process occurring in one specimen collected. "b" eggs from specimen in Fig. 14

which leads to the genital atrium. The few eggs are light-yellow in colour and variable in size. In one specimen (2, in the above table), the eggs bear at one end, a blunt hollow appendage measuring 16 μ long and 5 μ thick (Fig. 16). In the remaining specimens this appendage is entirely lacking. The presence of this unipolar process upon the eggs of the one specimen does not appear sufficient grounds for placing it in a separate species.

Discussion: The genus *Bivesicula* was erected by Yamaguti (1934) for a single species, *B. claviformis*. He considered that form sufficiently differentiated from the rest of the Monorchiidae to warrant the formation of a new sub-family. Later Yamaguti (1938) described two further species, *B. synodi* and *B. epinephali*. A further allied species which differed from the above three species in that the intestine and vitellaria extended backwards beyond the testis, and in that the uterus was limited to a region in front of that organ, was placed in a new genus *Bivesiculoides*. The same author (1940) raised the sub-family to family rank.

Bivesicula australis n.sp. resembles the three known species of the genus in the extent of the vitellaria and the uterus but it is similar to *Bivesiculoides* in that the gut rami extend almost to the posterior end of the body, and in the possession of the lateral pouches of the pars prostatica. It thus provides a link between the two genera. The length of the gut can no longer be regarded as a means of distinction between the two genera, and accordingly the generic diagnosis of *Bivesicula* must be amended to include species in which the gut rami may extend posterior to the testis.

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Pontobdella tasmanica nom. nov. (Hirudinea)

By

V. V. HICKMAN

(Read 5th November, 1946)

In the Papers and Proceedings of this Society for the year 1941, I described under the name of *Pontobdella verrucosa* a new Tasmanian marine leech. Professor M. C. Meyer has informed me that the name *Pontobdella verrucosa* is pre-occupied, having been given to a European leech by Dr. F. Leydig in 1851. It is necessary that a new name be given to the Tasmanian species and I therefore propose the name *Pontobdella tasmanica*.

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Note on *Hesperilla chrysotricha plebeia* Waterhouse (Lepidoptera-Hesperiidae)

By

L. E. COUCHMAN

In this note I record the capture of a butterfly which has remained for more than thirty years the rarest species of its group in Tasmania, no more than four specimens being previously known.

The species was first made known from Tasmania when Waterhouse and Lyell (1914) recorded two males from Bridport. These two specimens were placed under subsp. *cyclospila* Meyrick and Lower, which was originally described from 'Port Lincoln, South Australia: Melbourne, Victoria'.

Hardy (1918) identified a female taken at Latrobe, January 1st, 1915, as *cyclospila* M. and L., but did not describe it.

Waterhouse (1927) when separating the Tasmanian form as a distinct subspecies referred only to the two male specimens from Bridport taken many years before, and made no reference to Hardy's note of the capture of a female specimen.

Referring again to the Tasmanian subspecies, Waterhouse (1932) mentioned four males, from Bridport and Latrobe, but still did not refer to Hardy's female specimen from the latter locality.

Since 1932 this form has not been noted from Tasmania, and the female has remained undescribed throughout the years. As the only records were from Bridport and Latrobe I had considered this species would be confined to the northern coastal areas of Tasmania, but the chance discovery of two empty pupae cases of a form unknown to me on *Gahnia trifida* Lab. at South Arm in January, 1946, led me to suspect that this species might be found in the southern half of the island. A fairly close search on the eastern shores of the Derwent was not however productive of any specimens.

In January, 1947, while collecting on South Bruny, the chance capture of a perfect female specimen within a few yards of the shore line led me to search the extensive swamp area near Lunawanna, with the result that a few females and several males, including a pair taken in cop., were secured. A male specimen emerged at Hobart on January 18th from the only pupa found, although several empty cases were noted in the distinctive twisted shelters which the larvae form from a number of leaves of *Gahnia trifida*.

The description of the female is as follows:

Upperside: forewing brown, basal half covered with short yellowish hairs; cell spot 1·5 mm. square, pale yellow, hyaline; discal spots half this size in areas 3 and 2, a much smaller spot in lower half of area 1a, and a minute dot in upper half of area 1a, pale yellow, hyaline; three subapical spots, white, hyaline; cilia grey brown. Hindwing brown, basal half covered with yellowish hairs, an oblong central patch, and a few scattered scales below the patch, orange; cilia grey brown.

Underside: forewing brown, apex broadly snuff brown, area above cell spot dull yellow; hyaline spots as above; cilia grey brown. Hindwing snuff brown, at dorsum grey brown; a small spot in cell, brown centred silver white; a series of small elongate discal spots from 1a to 6, that in area 6 twice as large as the others, brown; the spots in areas 2, 3, and 6 centred silver white. Cilia grey brown.

Forewing length 17 mm.

Neallotype female labelled 'Lunawanna, Tas. 12-Jan.-47. L. E. Couchman', in the Tasmanian Museum, Hobart, one paratype, 'Lunawanna, Tas. 13-Jan.-47. L. E. Couchman', lodged in the Australian Museum, Sydney, and three paratypes, 'Lunawanna, Tas. 14-Jan.-47. L. E. Couchman' in my own collection.

In the type, and in two of the paratypes, the minute dot in upper half of area 1a of forewing is just discernible on the upperside, in the other two specimens it is only marked on the underside.

Since the male description was based on two specimens from Bridport, and does not in all respects accord with bred and captured males from South Bruny, I note these distinctions. In the Lunawanna males the ground colour above is brown, overlaid on the basal half of the forewing and the hindwing with a dusting of yellowish hairs; the three subapical spots are white, hyaline; the cell and discal spots pale yellow, hyaline, the spot in area 2 half the size of that in area 3; the grey black sex brand is composed of a series of crescents from vein 4 to below vein 1a.

The oblong central patch of the hindwing is orange, and usually there is a scattering of orange scales, divided by vein 4, below the central patch. Beneath, the elongate discal spots of the hindwing vary in size, but that in area 6 is always much larger than the rest, and like the cell spot is always centred silver white.

Forewing length 15 mm.

The rarity of this form would seem to be due to its excessively local character; although the food plant, *Gahnia trifida*, as noted by Rodway, is common in brackish swamps, and as I found, is abundant throughout the swamps of South Bruny, the butterfly was confined to an area of less than two acres, and no specimen was noted outside this one restricted locality.

It seems quite possible however, that this species may be found in other coastal localities, particularly on the northern and eastern coasts of Tasmania, but perhaps as restricted in area as on South Bruny.

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PLATE I

Hesperilla chrysotricha plebeia Waterhouse

FIG. 1.—Male, upperside. Lunawanna, Tas. 14-Jan.-1947

FIG. 2.—Male, underside of same specimen.

FIG. 3.—Neallotype female, upperside Lunawanna, Tas. 12-Jan.-1947.

FIG. 4.—Neallotype female, underside of same specimen.

All figures × 2.

(Photo., Tas. Govt. Photo. Lab.)

Phyllachne Colensoi (Berggren), an Addition to the List of Sub-Antarctic Plants in the Tasmanian Flora

By

WINIFRED M. CURTIS

Certain Tasmanian plants of the Austral-Montane formation are characterised by a peculiar life-form and are described as 'cushion' or 'bolster' plants. These plants grow in dense tufts and make hard convex patches on the ground. Each may be several feet across, forming a compact mass that is firm underfoot.

Phyllachne Colensoi (Berggren), belonging to the family Stylidiaceae, is a cushion plant similar in habit to four plants that are common on Tasmanian mountains. These four species included by Rodway (1903) in 'The Tasmanian Flora' belong to three different families, namely:—

Compositae	*Abrotanella forsteroides* Hk.
	Pterygopappus lawrencii Hk.
Stylidiaceae	*Donatia novae-zealandiae* Hk
Epacridaceae	*Dracophyllum minimum* F.v.M.

Specimens of *Phyllachne Colensoi* were collected in the Lake St. Clair Reserve, from the summit of Mt. Rufus (approx. 4000 ft.) by Mr. C. G. Elliott, B.Sc., in February, 1947. Material of this species in the Tasmanian Museum Herbarium (Rodway Collection) had been taken from the same locality in December, 1917, but had not been separated from the closely allied *Donatia novae-zealandiae*.

By the courtesy of Miss L. Moore, M.Sc., of the Plant Research Bureau, Wellington, I have been able to examine specimens of *Phyllachne* from the North and South Islands of New Zealand and from Auckland Island. The Tasmanian plant proves to be the *P. Colensoi* of New Zealand.

Phyllachne Colensoi (fig. 1) may be distinguished from other Tasmanian cushion plants by both floral and vegetative characters. The small flowers are solitary and terminal, scarcely raised above the general surface level of the plant. The calyx consists of 5-6 sepals, yellowish-green, rather thick, adnate to the ovary, the free portions being approximately ½ mm. in length. The corolla is white, gamopetalous, 5-6 lobed, the tube being as long as the sepals, and the lobes spreading. These may be rounded or irregularly lobed. Stamens and filaments are united with the style to form a column which is conspicuously exserted. This character serves to distinguish *Phyllachne* from *Donatia* in which the two stamens, though arising close to the base of the style, are separate from it. (For this reason *Donatia* is more usually regarded as a member of the Saxifragaceae, although the species shows affinities with the Stylidiaceae.) In *Phyllachne* the two reniform stamens are sessile at the top of the column, they dehisce transversely. Two stigma lobes protrude between the anthers. The inferior ovary is incompletely 2-celled: above it are two conspicuous fleshy glands. Both unisexual and hermaphrodite flowers occur. In the female flowers the stigmas are large and papillose but the anthers remain small, they shrivel before the bud is fully open. In the hermaphrodite and male flowers the stigmas are small and smooth.

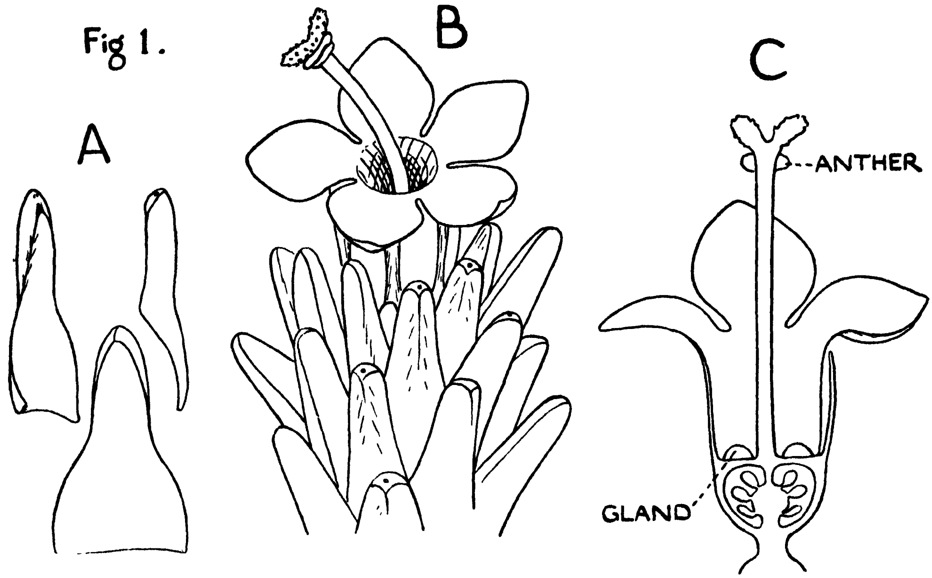

FIG. 1 *Phyllachne Colensoi* (Berggren), × 10. A, leaves, B, flowering axis, C, flower in longitudinal section

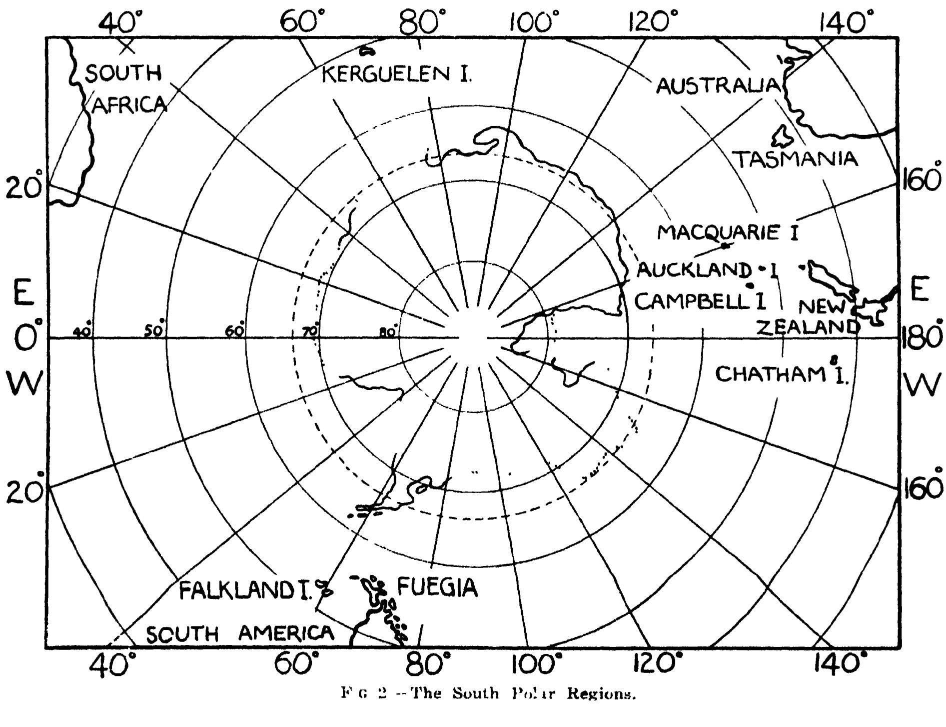

FIG. 2 —The South Polar Regions.

Allan and Wall (1946) record that the name Phyllachne (Gk. *phullon*, leaf: *akhne*, chaff) was given in reference to the subulate and glumaceous leaves and perianths. The leaves of *P. Colensoi* are closely imbricated: each is glabrous, linear and thick but widened and flattened at the base. The apex, which is often brownish-yellow in colour, is slightly spathulate. A glandular pore is present just below the apex on the abaxial side.

The family Stylidiaceae is a small one restricted to the Southern hemisphere and having its maximum development in Australia. The largest genus *Stylidium* reaches the West coast of the Bay of Bengal, other genera are found in New Zealand and in South America. The genus *Phyllachne* is known in New Zealand, in the Auckland and Campbell Islands and in Fuegia. The record of the occurrence of *P. Colensoi* in Tasmania is of interest in showing the distribution of this genus, belonging to a characteristic Australian family, to be circumpolar. Of some 100 genera and 56 species of plants listed by Hooker (1860) as common to the three great South-temperate land-masses, very few are representative of orders regarded as typically Australian.

Knowledge of the geological history of the families of Angiosperms is very incomplete. Modern flowering plants may be recognised in fossil remains of the Cretaceous and many of the families now restricted in area of distribution then had a far wider range. The existing isolation of Australia is geologically old and the characteristic flora would appear to have evolved in conditions of increasing aridity. This flora shows a relationship with that of Africa, a number of families, though few genera, being common to the two continents. A different type of flora is found on the mountains of Tasmania and S.E. Australia. This " Southern " flora contains few plants of the typical Australian orders, but the majority of the genera are peculiar to the South temperate zone and many are circumpolar in distribution. The dispersal of such plants across barriers such as the oceans as they exist to-day, is very difficult to visualise. Hooker (1853) examined the seeds and methods of seed dispersal of one characteristic plant of the Southern flora (*Oxalis Magellanica* Forst.) and concluded that its seeds could not be dispersed across the existing oceans. Some problems concerning the dispersal of certain plants having a circumpolar distribution in the sub-Antarctic are discussed by Rodway (1914). He supports Hooker's view that the botanical affinity between the floras of the South temperate continents and the islands South of them, can best be explained on the assumption that a large and more continuous tract of land existed in the Antarctic and was a habitat for plants, at the time when the chief families of Angiosperms were evolved. The present Southern flora would then be a relic of a flora once widespread, that has survived only at high altitudes. Among the few typical Australian plants in this flora the family Stylidiaceae is most strongly represented. The genus *Forstera* is represented by one species in Tasmania and three in New Zealand; *Phyllachne* is now known to be circumpolar in its distribution.

Donatia like *Phyllachne* is recorded from Tasmania, New Zealand and Fuegia, but the distribution of this genus, because of its affinity with the Saxifragaceae, raises other problems concerning the North and South migration routes of plants.

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Leaves from the diary of a Van Diemen's Land official

By

W. H. HUDSPETH

(Read 8th October, 1946)

INTRODUCTION

Before I ring up the curtain, and bring before the footlights the characters who played their parts upon the little Stage of Van Diemen's Land Society of the first half of last century, described for us with such fidelity in the pages of the Diarist about whom I propose to talk to-night, I ought, perhaps, to remind you that the circumstances in which they lived, and the various offices they filled, were vastly different from those of the present day. During those years Tasmania was a Crown Colony, governed from Downing Street. The Governor, the chief civil officials, the officers of the Army and Navy, and the Clergy, were all appointed and paid by the Imperial Government. They regarded themselves as a more or less privileged class, apart from and superior to the rest of the community, and were thus rather disposed to magnify their office, and to treat the ordinary residents as 'lesser breeds without the Law'. In return, they were often subjected to a deluge of criticism from Press and Public, which to-day would be considered as exceeding the bounds of good taste, and would probably involve the author in a claim for heavy damages for libel in a Court of Law.

The author of the Diary, GEORGE THOMAS WILLIAM BLAMEY BOYES, better known by his contemporaries as 'Alphabetical Boyes', was born at Stubbington in England in 1787. After leaving school he entered the Army in the Commissariat Department, and at the age of 24 years was sent to Lisbon, and served under Wellington during the Peninsular War. At the conclusion of hostilities he returned to England and married.

In 1823 he received orders from the Treasury to proceed to New South Wales, to join the Commissariat Department there under General Darling, as Deputy Assistant Commissary General, and when, in 1826, the Commissariat Department of Van Diemen's Land was separated from that of New South Wales, he was transferred to Hobart Town, to take up the office of Auditor of Civil Accounts, and remained in the Public Service of this Colony until his death, in 1853.

He might well be called 'The Samuel Pepys of Van Diemen's Land', for during the whole of his official life he kept a Diary, in which, like his famous prototype, he records almost every detail of his daily life. Its thirteen closely-written volumes, which are now in the possession of the Royal Society, contain, in addition to domestic and personal items, a mass of social gossip and scandal, obviously not intended for publication, as well as information of official and historical interest, and provide us with an extraordinarily vivid picture of contemporary life in this community.

With the possible exception of the Knopwood Diaries, they constitute, perhaps, the most complete personal record of current events yet discovered.

His official duties were competently performed, and he enjoyed the confidence of all the Governors under whom he served, and, what is more remarkable, he managed to steer clear of conflict with those among whom he moved and worked. Arthur speaks of his 'zeal, ability, and urbanity, gratifying to the Government and residents of the Colony', and even the V.D.L. Chronicle, in commenting on his appointment as Colonial Secretary, expresses satisfaction that the post had gone to a man 'of known amenity of manner and amiable disposition'. This was high praise, indeed, from a paper noted for its hostility to the Franklin régime.

Mr. Boyes' official position as Colonial Auditor, Colonial Secretary, Caveat Commissioner, Member of the Executive and Legislative Councils, and Member of the Committee of the Queen's Orphanage, brought him into contact with all grades of Society, and his pen portraits of contemporary notabilities are among the most interesting items in the Diary. From these, and from his descriptions of current events, I have selected such passages as may, I hope, afford both historical interest and entertainment. I take no responsibility for the opinions and criticisms expressed, which are solely those of the writer, and are reproduced for the benefit of students of Tasmanian history (1).

Let us take first his sketches of the four Governors under whom he served:

Col. George Arthur

Of Lt. Governor George Arthur he says this: 'B— in the course of conversation said there was a chilling formality about Government House that he could never bring himself to feel easy under. He believed there was no want of intention to do what was civil and agreeable and to make themselves popular, but the fact was, and it was useless to attempt to conceal it, they had not the tact and did not understand it. He said, however, that Col. Arthur was a different man tête-a-tête. He was with him one evening after Council till twelve o'clock, toe to toe, until they had finished two bottles of port, . . .'

Dr. S— told me that he was once sent for to attend Mrs. Arthur when she was in a very alarming way. He was at Government House two, three, and four times a day . . . . and by dint of the greatest care, and at the expense of a considerable portion of his time, effected a perfect cure. In the course of his attendance he was never asked to take a glass of wine, or other refreshment, and, when he announced to the little great man that the patient was restored, he was dismissed with thanks so cold that it chilled his heart to receive them . . . '

'S— said that Arthur, when he had any measure to effect, never dashed boldly at it, like the eagle soaring in the sunbeams, but set to work underground, like a mole, and, after you had been wondering where he was gone, and what he was doing, you discovered him rising out of the ground, after a subterranean, tortuous track, at the further end of the field . . . . '

'B— spoke of Arthur's excessive unpopularity—said that he was universally disliked, that he had a most convenient memory, forgetting when it tended to his interest, and remembering on similar occasion. That Montagu, his nephew, railed against him as much as anybody, and that not a single solitary individual amongst all the Civil Officers placed the least confidence in him. That he treated those who were disposed to be his friends with coldness and neglect; at the same time he stood in awe of the Editor of a public newspaper, and would at any time give 1000 acres to stop the vituperation of a Murray, or a Gregson.'

'S—, as usual, full of Arthur's ill-treatment of him, Said that whenever he suggested a prosecution on the part of the Crown, Arthur attributed it to his desire to embroil him with the people and make him unpopular . . . . He said

(1) For reasons which will be apparent I have, wherever possible, used initials of persons referred to.

he would write Home for another appointment, as there seemed no chance of Arthur's removal. If A. went to New South Wales to succeed General Bourke, he ' (S—), ' would not go there.'

' The Government of the Colony is nominally vested in the Lt. Governor and an Executive Council. I say nominally, because the Executive Council, as a Body, is powerless. The real Government is composed of Col. Arthur, his two nephews, and Murray, the Editor of the " Tasmanian " newspaper.'

Strange to say, he throws doubt upon Arthur's understanding of the penal System:

' He relies ' he says, ' upon others—indeed, the habit of viewing things with the eyes of others disqualifies him from profound and useful observation. For a little time it was supposed, though, as it turns out, erroneously, that he made use of his own. But, after trying Hamilton's Stephen's, and those of a few others, he has settled down into an absolute abandonment to his nephew's guidance, and is content to depend exclusively upon Capt. Forster's optical apparatus. When sojourning for a short period at the houses of Settlers in the interior, his eyes are not more likely to be cleared of the films of prejudice that obscure them than when recreating his pen and ink faculties in the Council Room at Government House. These people are aware of his peculiar and distorted way of considering the ramifications of prison discipline, and take care not to risk the loss of favour by citing instances, or volunteering information in the slightest degree opposed to his favourite theory. The Archbishop of Dublin, at a distance of 16000 miles from the experimental ground, is evidently much better instructed upon the real merits of the System than His Excellency himself, notwithstanding a residence of twelve years, and all the means and appliances to boot. So much for obstinancy and blindness . . . '. As to Arthur's relations with Lathrop Murray—he says:

' B— called upon me, and related an extraordinary interview that Murray had with his Ex., in the presence of Macdowell, at His Ex's request: His Ex.—" I wish to ask you, Mr. Murray, whether there is any truth in the report that I am on intimate terms with you? " Murray. " I beg to say that I do not consider it would add to my respectability if I visited Government House, I do not require any aid from the reputed intimacy of the nature alluded to, to improve or preserve, my standing in Society." or words to that effect.'

He relates the manner in which the news of Arthur's recall was received:

' N— looked in and asked me if I had heard the news, I replied in the negative. He then said that Col. Arthur was recalled . . . The Despatch was brought by the " Elphinstone ", but only opened that morning. It was all over the town in half an hour. The news seemed to diffuse general joy.'

Then follows an account of the farewell Levée at Government House:

' I took leave of Col. Arthur. " Goodbye Mr. Boyes ", said His Ex. in a tremulous tone. " How are Mrs. Boyes and the children? God bless you all." Immediately afterwards he walked from the Drawing Room, where he had taken leave of us, round by the verandah, leaning upon Mr. Pedder's arm, and weeping bitterly. Then up to the turning by the Courthouse and down Murray Street, to the New Wharf, followed by all the Public Officers, Civil and Military, and by several hundreds of the Townspeople—and embarked in the midst of cheers and under a Salute from the ships in the harbour.'

Before passing away from Col. Arthur, you may be interested to hear Mr. Boyes' account of the Campaign organized by Arthur against the aborigines, known as ' The Black Line '. It is contained in a letter, dated 31st October 1830, written to his wife, who was then in England: " Now "—he says—" for a little about the state of the Colony, which is at this time pecularly interesting, being

pregnant with important results. By some mistake or other, the Aborigines of the Country (Blacks) have been led to look upon the white intruders with hatred, malice, and all uncharitableness. I hope sincerely they have not been taught the trade of butchery, which they have been indiscriminately carrying on for the last two or three years, by those who, if they have so done, are a thousand times worse than the savages themselves. It is generally supposed that the whites, if not the original aggressors, have, by seizing on the black women, and otherwise ill-treating the wild and ignorant denizens of the forests, greatly contributed to aggravate the roused ferocity of their natures. However that may be, for a long time past they have been the dread of the Interior of the Island. They have murdered Storekeepers by dozens—they have rushed upon the cottage of the Settler, and consigned men, women and children to indiscriminate slaughter. Scarcely a white man has ever approached their haunts and escaped with life. Our papers were filled weekly with the atrocities of the Blacks, and it had become apparent that, unless means were devised for allaying the cruel spirit of these wretches or of making them prisoners in a body in some well-adapted part of the country, or of exterminating the race, that the country must be abandoned. All other means having been tried unsuccessfully, the Government found itself reduced to the second and third of the experiments just mentioned, and with that object in view the most vigorous and extensive measures have been taken that the resources of the Colony could put into operation. It appeared that if a line of posts were to be formed from the sea on the eastern coast to a certain district westward, the most active and dangerous of the tribes would be shut up in the south-eastern portion of the Island, and that by approximating the posts, quietly and steadily, to each other, advancing gradually at the same time southwards, the Blacks would be forced to retire, until driven to a neck of land which separates a considerable tract from the Main, forming almost an island; and then, assailed with all the collected strength, they would be obliged to seek shelter from the arms of their enemy by defiling through the narrow isthmus, which having once done, their capture would be considered effected. The spot is easily defended by a small party, and a depot is already established for supplying them with provisions, as it is evident that, cut off, as the Blacks would be in that situation from their natural resources, they would depend entirely upon the Government for food and protection, and thus in time be probably brought into a state of civilization, if of such they are capable. To do this we have all been obliged to contribute in some way or other. The Governor has taken the field with almost all the military; The ticket-of-leave men, Constables, and as many assigned servants as could be spared, have been marshalled, equipped for the field, and distributed, like the soldiers, along the line, or formed into parties scouring the Bush. Many of the young men, clerks in public offices, have put knapsacks on their backs, rations in their pouches, and guns upon their shoulders, and have marched, in charge of ten or twelve men each, to the destined scene of action. The military duties of the Town are performed by the inhabitants, generally officered by the most respectable, and, as I am one of thé elect, if you had chanced to walk up the street at a propitious time, you might have seen "Capt. Boyes", as his men call him, though in truth he can only be a non-commissioned Officer upon his service, walking down the same street with half-a-dozen parti-coloured soldiers, with muskets and bayonets fixed, forming the relief. That Gentleman has now been four times on Duty, that is to say every sixth day and night. The Main Guard relieves at six in the morning, and remains on till six the next. It is very tiresome, and (to drop the third person singular for the first), I am quite sick of it. The strangers just landed from two or three ships from England stare at such an unusual sight of men in plain clothes performing military duties, with all their eyes.

It will continue, I am afraid, some weeks longer. The Governor is disposed to believe that his operations have been completely successful up to the present time, and I hope they have. They also believe that there are white men acting as leaders among the Blacks, and inciting them to atrocity. It is only lately that this impression has been received, and, if it should be true, it will account for many circumstances attending the movements of the Natives, which before were wrapped in mystery."

A few days later he writes:

'The Lt. Governor and the Forces, both Civil and Military, are still in the Bush. Nothing decisive has taken place, but there is now reason to believe that a considerable number of the Natives are enclosed, and will ultimately be made prisoners.'.

Note.—As we all know, the Drive was a complete failure. It cost, all told, about £60,000, and the nett result was the capture of one man and a boy—and that was accidental!

Sir John Franklin

The next vice-regal figures to come under the spotlight in the Diary are Sir John Franklin, for whom he seems to have had a good deal of sympathy, and Lady Franklin of whom he speaks in terms of the highest admiration. His regard for Sir John, however, does not blind him to his defects as an Administrator, as will be seen from the following extracts:

'Saw N—. He adverted to a rumour of Sir John Franklin's desire to return to England, he being thoroughly sick of the complicated official labours, and the political discontents which wait upon his Government.' (This was in December 1837—barely eleven months after his triumphal arrival in January of that year)

'If', he adds, Sir John expected to slumber upon a bed of roses, fanned by balmy airs impregnated with "spicy odours from Araby the blest", or even exemption from the common crosses and vexations that attend even the ablest and most successful Administrator, he has, no doubt, been grievously disappointed. Had he brought with him some experienced, practical man of business, in whom he could have reposed confidence, his position here would have been happier . . . . As it is, I believe there is no hope for him but in retiring from a post for which, from all I can collect, he is totally unfitted.'

And again:

'Forster said that the Governor has got a "severe dressing" from the Treasury for interfering with the Customs . . . . He said it was the strongest expression of disapproval of a Governor's conduct he had ever seen, and desired His Ex for the future to refrain from meddling with the Customs, being a Department immediately under their Lordships' control.'

(This was followed, soon after, by another reproof to Sir John from the Treasury, in regard to arrangements made by him with the local Banks as to deposits of money from the Military Chest.) . . .

'Saw Mitchell at the Colonial Secretary's office, who was amusing at the expense of poor Sir John, whose nervousness and utter unfitness for business seems to form a stock of diversion for both Master and Man.' And here is a glimpse of Sir John's delight in the visit of Captains Ross and Crozier: 'At Government House. Sir John enthusiastic about the discovery ships—the "Erebus" and "Terror", He was quite warmed into enthusiasm, and spoke with such delight about the experiments and consequent calculations made by the Commanding Officers that he never looked to such advantage before.' But in matters of business and administration poor Sir John was rather at the mercy of his advisers: 'Thinking over all that passed between Sir John and myself the day before yesterday, it appears that

he has adopted the likings and dislikings, the opinions, views, sentiments, and even the very words, of those who are supposed to take the trouble of thinking for him.

All this time, while the self-deceived Ruler is merely giving utterance to the thoughts, and acting upon the subtle suggestions of his crafty advisers, he—honest man—flatters himself—nay believes—that in all he says and does he depends upon his own judgment alone, and that his mind is perfectly untrammelled, and thoroughly independent of all extraneous influences whatsoever.'

Sir John, as you know, was a little deaf, and probably got bored, as other people sometimes do, at meetings, such as we are attending to-night.

Here, for instance, is a picture of him at a meeting of our precursor, the Tasmanian Society: 'A paper was read on New Zealand—very badly, and so prosily that it sent Sir John to sleep. He snored, and blew like a grampus.'

I am sure many of you will sympathise with him.

About this time the trouble between Sir John and his Colonial Secretary, John Montagu, which had been brewing for some months past, was coming to a head, and there are frequent references to it in the Diary:

'From E— I heard that Montagu appeared out of spirits. Sir John has a fine game in his hands, if he knew how to play his cards, but, notwithstanding the abetting and encouraging of Lady Franklin, Henslowe' (Private Secretary), 'and young Bedford, I suspect he will forego all his advantages and make an inglorious peace with the offended power, by admitting he was wrong, and soliciting oblivion for the past. I have taken no part in the business, and do not intend to take any. If inclined to mix in the intrigues of a Government House, Sir John, with many good qualities, is about the last to trust oneself with. You could not calculate upon his coalescence for a week together, unless he could be kept in a constant state of excitement.'

'One thing is quite clear. He has reposed too much upon the zeal and fidelity of Montagu and Forster, and now finds that he has been altogether mistaken in them.'

Soon after this Montagu was dismissed, and there is this entry:

'When I left mv office at four, the news had spread like wildfire. G— and S— said that all the Settlers would rejoice at M's dismissal, and would consider that Sir John by this vigorous step had completely redeemed his character.'

(Mr. Boyes was immediately appointed Colonial Secretary in Montagu's place.)

After an interview with Forster he remarks that the latter had told him that Lord Stanley was puzzled over Sir John's contradictory Despatches about Montagu and himself, and had naturally said, 'Which of them am I to believe—this, or the former? They cannot both be true, for they are diametrically opposite in character'. Towards the end of the conversation Forster said that if Sir John did not go, he (F) should. He said that the person who had written the Despatches was the one to blame, and not Sir John, who, he said, 'Would sign anything put before him.'

In January 1843 arrived the Despatch which was fatal to Sir John's Government. On this the comment is: 'The Despatch is written in a pert, inconclusive style, insulting to a degree—becoming a Lordship, possible, but beneath a Gentleman: and if what is said be true, that a copy of it was transmitted to Montagu, as the Secretary of State's decision in his case, nothing but His Lordship receiving half a dozen shots from "Old Blowhard" can expiate the deep offence.'

The appearance and circulation in the Colony of Montagu's 'Book', in which he had set out his Case against Franklin, had created a tremendous amount of excitement, and greatly annoyed Sir John:

'He is much disturbed', says the Diary, 'with a report that there is a Manuscript Book in this Colony, containing the whole of Montagu's "Case", as he puts it, and the conversations that took place between him and Sir John, including a long letter from the Rev. Fry' (Rector of St. George's Church), 'saying many things that must now jar on his ear, as he, of course, never expected this communication would come back to the Colony. Friends or foes, they are all served up, to suit Montagu's pleasure or convenience, with a selfish recklessness that I know no other man capable of.'

(Montagu had sent the Book out by Bicheno to Forster, with directions that when he had read it he was to forward it on to Swanston, Manager of the Derwent Bank, for private circulation among his friends.)

Sir John wrote to Swanston, calling upon him to shew him the Book, but the request was not complied with: 'He was very indignant with Montagu, Swanston, and all those who had read the book, and particularly against John Kerr, who had read it and would not tell him the contents.'

After this, events moved swiftly—Sir Eardley Wilmot arrived, and there was nothing left for the Franklins but to pack up and go.

On November 3rd 1843 they took their departure, after the presentation of a farewell address: 'Poor Sir John. He seemed to feel deeply this last public testimony of regard. At five, or a little after, we left his house. The Bishop on his right, Bicheno on his left, and immediately following him, in a cross line, the Attorney General, Maclean, old Bedford, the Archdeacon, Bagot, Fraser, Henslowe, and myself—surrounded by about 2000 people, who rent the air, and made the welkin ring with their shouts. The Brigade Major, in full Staff Dress, walked at the head of the procession, a few paces in advance of Sir John. As the Barge shoved off, a Salute was fired from the Prince of Wales Battery. The Barge was steered by Moriarty in his full dress as a Commander of the Navy.'

Lady Franklin

One of Montagu's chief charges against Sir John Franklin was that he permitted his wife to interfere in public affairs. We have had a hint of this already, and there are other entries which seem to indicate that there may have been some foundation for the accusation: Here is one: 'Dined at Government House. Took Lady Franklin in, and in the course of the evening talked to her upon the following subjects—The Executive Council, as now constituted, permitting every question to go one way, the Colonel commanding' (Col. Elliott) 'being nobody, and Turnbull being completely under the influence of the others; Burnett's coming out, and considering what his position would be in the Executive Council. She agreed with me.' And another:

'The Lt. Governor brought in, to show Lady Franklin and myself, a letter he had written to Major St. Maur at Launceston, about an indiscretion of Mr. Breton. Lady Franklin suggested that he add a paragraph that he, Sir John, notwithstanding the indiscretion, should not feel less disposed than before to give the Launceston people every assistance in his power.'

Of her character he speaks in the highest terms, notably in his account of her anxiety about the fate of Bastian and party, who had gone to their rescue during their trip to the West Coast: 'Dined at Government House . . . . in the course of the evening I had a good deal of conversation with Lady Franklin about Bastian and his party. She was very much moved at contemplating their probable fate, and burst into tears while talking about them.'

The next day he received from her a letter on the same subject:

'This generous, kindhearted woman is full of the most painful apprehensions for their safety, and implored me, if I could suggest any measure possessing the slightest claim to the probability of affording them relief, or, at the worst, of determining their fate, to adopt it at once, and how gladly—oh, how gladly—she would bear the expense, whatever it was. She begged I would not allow any consideration of that nature to weigh with me for a moment. It was horror itself to think of leaving those poor, gallant fellows to perish, who had undertaken their dangerous, and, she was afraid, disastrous enterprise, to rescue Sir John and herself from the perils with which they had been surrounded. She should never forgive herself if it afterwards appeared that there had been some means left untried . . . .

'She is certainly a noble creature—she deplored the conditions of the lost party in terms so eloquent, and yet so true to the heart, that I became as much moved as herself.' (The Bastian party was rescued in the end.)

Lady Franklin was of course greatly worried about the Montagu affair and its reactions on her husband. Soon after the arrival of Mr. J. E. Bicheno appears this entry: 'She came to the determination of asking Bicheno whether he had any reason to believe that a successor was appointed, or about to be appointed, to Sir John. She did make the inquiry, and Bicheno told her that he had no doubt about it.'

SIR JOHN EARDLEY EARDLEY-WILMOT, BART.

The next figure to come upon the stage at Government House was of a type very different from his predecessors.

In August 1843, before Franklin had relinquished his post—even before he had received official notification of his recall—there arrived, like a bolt from the blue, his successor—Sir John Eardley Eardley-Wilmot, Bart., of Berkswell Hall, County of Warwick, formerly M.P. for North Warwickshire, and Chairman of Quarter Sessions of the County of Warwick. His ship had overshot the mouth of the Derwent, and landed him on Forestier Peninsula, before anyone knew of his advent. At 2 a.m. Bicheno, the Colonial Secretary, was roused out of bed by a messenger who said that His Excellency was travelling overland from the East Coast, and would reach Hobart Town that evening.

In spite of the awkward fact that Sir John Franklin was still in Government House, things seemed to have passed off very well, in an atmosphere of cordiality. The usual addresses were presented, the usual Levée held, and the Franklins retired to a private house . . . .

But these happy conditions did not last for long, and before six months had passed it was apparent that the relations between Sir Eardley and his Colonial Secretary, (the Chief Executive Officer of the Colony) were becoming strained, and the sticklers for vice-regal propriety were beginning to raise their eyebrows, and to whisper in corners about His Excellency's lack of dignity and decorum.

'There can be no hope', says the Diary, 'of a steady, effective administration, when the two chief personages differ essentially in policy, and take no pains to hide their want of unanimity.' And again: 'Saw Bicheno, and advised him to see and consult His Ex more often. I hope he will, or there will be no chance against that unprincipled, intriguing, ambitious fellow Foster, to whose opinion Sir Eardley defers upon every occasion.'

A little later, after an interview with Sir Eardley, he says:

'He went on in a course of unqualified vituperation against Bicheno. He declared that there was nothing done—that he could get no information from the office; that he could not possibly go on with such a clog upon his government . . .

altogether I have never heard such a collection of inconsistencies and unconnected matters rattled through in my life before. He skims the surface of his subjects, just picking up the light rubbish swimming on the top. He does not appear to me to have the capacity of going deeper, or making himself master of the facts in any case. Judgment, prudent reserve, discretion, are qualities to which he seems an utter stranger. I am told that wherever he is, he carries on this silly gossip with old men, or young wives, or daughters. In short, it is hardly possible to imagine a person so utterly disqualified by an absence of all the elements of wisdom for a Governor. Forster, I understand, says that he will not be here twelve months longer.'

There are other entries in the same strain, relating to the Governor's efforts to curtail expenditure in the civil administration, which were naturally resented; to his relations with Bishop Nixon and the Rev. Ewing; to his troubles with the Legislative Council, which, as you know, culminated in the resignation of "The Patriotic Six"; and to other matters, on which I cannot now dwell. Those of you, who are interested, will find the whole subject of Sir Eardley's administration ably and dispassionately dealt with by Mrs. Kathleen Fitzpatrick, in an article published in 1940 in the Magazine "Historical Studies" Vol. I. No. 1, p. 31.

On August 25th, 1846—three years after his arrival, at a meeting of the Council, Sir Eardley announced to the Members that he had been recalled.

'He was much agitated', says the Diary, 'towards the close of the address, when he spoke of the kindness he had received from many in the Colony . . . . Poor Sir Eardley! Could he have known, before he started from England, that he had been selected by Lord Stanley as the chief instrument in the solution of one of the most difficult of human problems, perhaps . . . . he would have hesitated before he accepted the offered honour of the Government of Van Diemen's Land, and embarked upon the almost boundless and turbulent ocean of difficulties, with which that honour was attended.'

There is no doubt that Sir Eardley's treatment by Mr. Gladstone preyed upon his health and spirits. He became ill, and, barely six months after his recall, died at Hobart, in the little cottage behind the Museum, then occupied by the Governor's Private Secretary. He was buried at St. David's Cemetery (now St. David's Park) and the graceful Gothic Monument to his memory, still standing there, was erected by public subscription.

Sir William Denison

The last of these vice-regal portraits etched for us in the Diary is that of Sir William Denison, who arrived in Van Diemen's Land in January 1847, shortly before the death of Sir Eardley Wilmot. He was a retired Captain of the Corps of Royal Engineers, who had had considerable experience in the construction of docks and other naval works for the Admiralty—an experience of which this Island reaped the benefit during his administration. He was a man of strong personality and was subject to seizures, which probably affected his temper, and may have been responsible for the occasional outbreaks of intolerance and arrogance referred to in the pages of the Diary. The first manifestation of this occurred a few days after his arrival when Mr. Boyes had the unpleasant duty of informing him that he was not entitled to half salary from the date of his embarkation, at which 'he did not seem particularly well-pleased', to put it mildly.

One of the legacies left him by his predecessor was the settlement of the battle raging over the withdrawal of the Patriotic Six from the Council, and the legality or otherwise of the appointment of their successors. The new Governor indicated that he had determined to dispense with the services of the substitutes,

and to call upon the original Members to resume their seats. This gave great offence to the new Members, who felt that 'they had been grossly insulted, and their feelings deeply hurt.'

His next step was to insist upon drastic retrenchments in the civil Departments—a step which made him extremely unpopular:

'If'—says the Diary—'the Public Officers in the Colonies are to depend upon the whim or caprice of each Governor who succeeds to the administration, for permission to continue in the exercise of their offices and the enjoyment of the emoluments belonging to them, then these gentlemen have good reason to complain of broken faith on the part of the Home Government, for, in the case supposed, the Queen's appointment is not worth a farthing. This would be bad enough in England, among a man's own friends and relations, but here, at 16000 miles off, to be deprived of his salary, or even to suffer a diminution of it, is, in nine cases out of ten, absolute ruin . . . .'

'It is really too bad,' he goes on, 'to consign over a parcel of unoffending, loyal men to the mercy of a rude, malicious, captious, petty tyrant. If Mr. Gladstone was constrained, by family or friendly obligations, to appoint such a man, it should have been to a Government upon the African Coast—a Settlement in the Bight of Benin, at the mouth of the Niger, would have been a proper place for his protegé—for, when he had driven away all the civilized beings, he might have found exercise for his heart and mind upon the Niggers. Sir Eardley was a gentle, humane, peaceable Governor, a very House Lamb—compared with the present . . . . Our friend is certainly a sneering, captious, arrogant, tyrannical fellow as ever belonged to the Army.'

Soon after this tirade he tells us that 'The Lt. Governor had an attack of his old complaint, and fell down in the street this morning, almost in front of the Commissarist. He was alone, and strangers picked him up and carried him to a Public House close at hand.'.

The Governor was very angry over the rejection by the Council of The Schools Enactment Bill:

'He said that if he was beaten this year he would bring it on the next, and continue to do so till he had carried it.'

Then the Roads Bill was thrown out:

'O'Connor said it was preposterous for a young man like the Governor to come here, and, before he knew anything of the people or the country, to attempt to cram such a Bill down the throats of the Council.'

Another entry, a few days later, throws further light upon Sir William's irascibility. The Commissioner of the Court of Requests at Launceston (Mr. Knight) had ventured to question the validity of a Bill which had been introduced by His Excellency:

'His Majesty, on looking at the letter, sprang from his chair, assumed a violently hostile attitude towards poor Bicheno, and, as soon as the burst of anger could find utterance, roared out 'DAMN HIM. KICK HIM OUT. TURN HIM OUT INSTANTLY—HE IS A FOOL AND AN ASS.'—After a time, during which the explosive force exhausted itself, Bicheno mildly ventured to question the propriety of turning a man out of office for merely holding a different opinion from His Excellency upon a point of Law—that man, too, being a Lawyer. But nothing for a long time, could soothe him into reason, and he kept repeating 'Damn him. Kick him out. He is an Ass—a Fool.' In the end, after the lava had boiled over and ceased to flow, he listened with some degree of patience to Bicheno's proposal that he should quietly take the opinion of the Law Officers upon the subject, and for the present say no more about it. So ended the last eruption.'

There are, of course, many entries about convicts and their treatment, and on the merits and defects of the Penal System, on which I do not propose to dwell. But the writer's experiences and trials with convict servants are worth recording, because they show, unconsciously, what was probably the attitude of most people towards that unhappy class:

'Both my prisoners servants', he writes, 'took themselves off about one o'clock, and I found them, at four, in the Public House opposite. Sent them to the Watch-house, and next day at the Police Court one was sent to the treadmill for 48 hours, and the other discharged. Called at the Police Office and preferred a charge against the gardener for drunkeness. He was sent to solitary cells for 48 hours, upon bread and water—'A very salutary discipline'—he adds—'and if administered every fortnight would be attended with much benefit to the moral and physical health of most assigned servants.'

There was, of course, another side to the picture, as will be seen from the following entries: 'Having applied to the Assignment Board for a prisoner servant, you are recommended to await the arrival of the next ship, which advice, having no choice, you are constrained to take.

The ship at last comes to an anchor, and, soon after, you have the most satisfactory evidence that your application has not been overlooked in the appearance of a hopeful youth, in a new suit of solemn grey and vivid yellow, and under the charge of one of those respectable characters who are paid 2/- a day by the Government for lounging about the streets all day long, with a short club in their jacket pockets—and twice that amount by the Public House keepers, for passing their doors without looking in, or, being in, for seeing nothing but the colour of the liquor they are about to swallow.

A receipt for the gentleman in the parti-coloured dress being delivered, he is at once upon your establishment.

In your application you had carefully described the qualifications you required—"a House Servant, who could wait at table"—and you are now agreeably surprised by finding, domesticated under your roof, for better or worse, a Cornish ploughboy, who had never seen a Mahogany table in his life, and who was expatriated for attempting a few gaudy bandanas at St. Just Fair . . . . However, you have already upon your establishment two or three other members of the tardigrade tribe, and this last accession to your numerical strength *must* be a House Servant, and *must* wait at table . . . . In about six months from that time, and just as the unfortunate tiller of the Cornish soil—(all rogues being unfortunate when they are caught out)—is beginning, at a fearful cost, to make himself useful—having in the experimental process utterly destroyed a China Dinner Service, chipped and broken £15 worth of Cut Glass, scratched your Plate with sandpaper, and used the furniture brushes in scrubbing, with the aid of soap and water, the French polish off your tables and sideboard—you receive a Note from that very respectable Personage, the Principal Superintendent, requesting you will be good enough to dispense with the young man's services the Government having it in contemplation to make him a Constable, for which situation he has been strongly recommended to the Chief Police Magistrate . . . . After an interval of a few months, during which your family must wait upon one another—if they must be waited upon at all—you are exposed to new trials of pain and patience . . . . At the end of the year, if you keep any accounts, you come to the conclusion that, after all, the unpaid services of compulsive labour are not so desirable, in point of economy, or, indeed, in point of convenience, as you have been led to expect, notwithstanding the very clever Despatches of Sir George Arthur to the contrary, written before his Title was conferred.'

And here are a few scenes which were not infrequent in the domestic menage: '" Regatta Day ". Servants all drunk, of course, and the gardener gave Ann a thrashing in the kitchen, to prove his love for her, and enmity to a supposed rival. The gardener and the women servants were all drunk, and would not go to bed till 3 a.m., in spite of anything their Mistress could say to them . . . Servants drunk again. Williams, the Constable, whose wife was drunk and would not go to bed, finding his patience exhausted, got up about 11 O'clock, dragged her out of the kitchen, where she was rattling away with Davis, and gave her a good thrashing.'.

And the following incident, which shows the moral effect of the Convict ship 'Anson', on which female prisoners were kept pending Assignment: 'About 11 o'clock there was a tremendous uproar in the kitchen and about the door. A young woman, not long in the Colony, and only one little month from the wholesale " Abstergent of Vice " the Anson, had become most heroically drunk. Braving all the authorities, the Police in particular, there she was, keeping Benjamin, Thomas, and the gardener, at arms length, and the kitchen to herself—screaming, dancing, howling and insulting a poor little Constable, who had made his appearance, with a Musket, to take her away. I walked up and down the verandah to prevent her entering the house, and it certainly did occur to me that she every now and then compelled the little Constable, Musket and all, to join in her gymnastic exercises. I was obliged to send for more assistance, but it was upwards of two hours before they reached the Watchhouse. They were obliged to lash her into a wheelbarrow, and, while in transit, the whole Welkin rang with her shrieks and imprecations. When before the Magistrate next morning, Esdaile, the District Constable declared that in the course of twenty years he had never heard such language, or anything approaching it, proceed from the mouth of a woman. It must be remembered'—he adds—'that she had just become entitled, under the excellent regulations of the " Anson ", to the privilege of going into private service. What a valuable character to have in a family of young ladies and gentlemen.'

(Next day, the unfortunate woman got three months in the Factory—two with Hard Labour, and one in a Solitary Cell.) . . .

And there are a host of minor characters who play their parts in this colorful Pageant of Van Diemen's Land Society. One after another, from the Chief Justice on the Bench to the convict servant in the kitchen, they have their exits and their entrances, and sometimes the writer takes us behind the scenes, and shows them to us in their dressing rooms, without their make-up—a sorry spectacle indeed. We see the Machiavellian Montagu and his brother-in-law Matthew Forster—once the dominating figure of his day, but now only a name upon a crumbling tombstone in a disused Cemetery: James Ebenezer Bicheno, the genial Colonial Secretary—more like a jovial farmer than a politician—fat and smiling, fond of good living and good company, ever ready to oblige with a song, and annoyed with his portrait by Bock, which he complained 'made him look like a Bishop, or a stall-fed ox, dosing after a meal.'

And Bishop Nixon, fussing over the Exhibition of pictures at the old Customs House (the first exhibition of its kind ever held in Australia), bustling about, running up and down the stairs, chattering to everybody, as if his reputation as a Connoisseur of the Fine Arts depended upon its success; or at other times irritating Mr. Boyes by his neighbourly habit of borrowing his horse whenever he had any heavy work to be done at Runnymede, though he had horses of his own, eating their heads off in his stables.

And Joseph Allport, the great-grandfather of our esteemed Vice-President, of whom he says this:

'Certainly the most able, most experienced, and most successful manager of all disputed cases. I would prefer him professionally to any of the Bar. He is remarkedly clear-headed, and possesses an inexhaustible stock of impudence and self-sufficiency, which nothing can put down.'

And Captain Wentworth, of the 63rd Regt., making a scene at Government House, because his hat had been crushed, and, forgetting where he was, abusing the House, the Governor, politics, establishment, Colony, and everything else, until Capt. Forth had to intervene for the honour of the Service and of Vice-Royalty; And Col. Logan, also of the 63rd, with his interminable, pointless stories at the dinnertable, stifling all conversation, so that even professional talkers had to give in, either in despair or disgust; 'Holy Willie' Bedford and his son, the Doctor: G. W. Evans, the Surveyor-General: the artists Glover, Bock, Simpkinson and Wainewright—and a multitude of other figures, who flit across the stage and vanish into the wings in bewildering succession.

But time is running on, and I must pass to other aspects of social life depicted in the Diary.

Among the duties entailed by Mr. Boyes' official position was that of attending parties at Government House, and his description of some of these is worth quoting:

At an afternoon given by the Arthurs 'there was a great assemblage, over 200. The front verandah was latticed in, and the open spaces of woodwork filled up with roses, geraniums, and native shrubs—and the company on both sides of the tables extended the whole length. The Governor, after his health had been drunk, rose and made a neat speech about friends and enemies—delicately allusive to the manner in which some few of his hearers had been in the habit of treating him.'

At another, given by the Franklins:

'An evening party, about 450 present; came away about 2 o'clock heartily tired with the bad supper, bad dancing, stupid people, and the clouds of dust '

And the Birthday Ball of the Denisons:

'It was much crowded, very dusty, indeed almost to suffocation, and altogether very disagreeable. The young women were extremely plain, and such dowdies—where could they have come from? From the Mother Country, I suspect, or else from the far west of the northern side of the Island—on the wrong, uncivilised side of Deloraine. They were never born in the reclaimed districts.' At another—'The Young Beauties, in White Muslin', were sitting or reclining in clusters about the room, fresh and fair as a rich bed of roses, raising their delicate heads above the light wreaths of a June snowfall.'.

And while on the subject of dress,—here is an amusing comment on the recently introduced fashion of wearing a bustle, taken from a letter written to his wife in 1831—(she was then in England.)—'By the bye, do you wear a bustle? This article of female attire excited considerable surprise and speculation among the Goths and Vandals of Van Diemen's Land, when it made its first appearance among us. We do not at all understand upon what principle of Political Economy so extraordinary a protuberance had proceeded . . . .'

Private entertaining was much more frequent then than it is to-day, and dances and dinner parties were common. Here is a description of a fancy dress Ball given by Mrs. Alfred Stephen, wife of the Attorney General: 'Cartwright' (the Solicitor), 'upon my addressing him in Spanish, taking him to be intended for a Muleteer, told me very candidly that he was a Swiss Peasant, but spoke no language but English, and that, I discovered, only indifferently. Allport' (Joseph) 'was admirable as a Chinaman . . . A Mr. Nicholas exhibited himself in a Court

dress of George I., with tin buttons on his coat as large as breakfast plates. There were Scottish Chiefs, and Hungarian Brothers, and, by way of experiment, a few had attempted the disguise of *Gentlemen*, in which it is clear they failed, since they were invariably known at a glance.

But the treat of the evening was Moore, the Collector of Internal Revenue—a fat, clumsy-built man, with large head and red face. His daughters had dressed him as a Spanish Grandee, in heavy, woollen garments and cloak, topped by a broad-brimmed hat of black, glazed Calico, to look like Satin, and an unwieldy plume of white ostrich feathers. Owing to the heat, greasy matter oozed out at every pore, and his face seemed to have been anointed with cocoa-nut oil. He could not wipe it, for fear of wiping off his moustachios and blackened eyebrows . . . . It is some time since I laughed so much. I left at 4 a.m. and at that time fresh candles had been placed in the Chandeliers, and they were whisking off in a waltz.'.

Then there is a dinner at Dr. Barnard's: 'Two of the men, who had miserable voices, sat for at least two hours before the piano, howling forth deplorable ditties, which they pretended to be beautiful duets from the Operas of "I. Puritani", "Don Giovanni", Il Barbiere di Seviglia", &c. No strains I ever heard were half so dismal and dolorous, not even those of a dog baying to the moon, or owls making their complaints to it.'

And an evening party at the Rev. Ewing's at Newtown: 'Among others present were Mrs. Fereday, the Tasmanian Nightingale, and her Showman—a tall, elderly, round-shouldered Engineer, Capt. Twiss, to wit—and his Lady. Everybody seemed exhausted with the civil things they were obliged to utter, after cudgelling their brains for something new. Mrs. Ewing, in despair, borrowed a complimentary speech from the Bishop, and found it answer very well. These Stars, by throwing every other voice into insignificance, and discouraging all attempts, by the way they excel, spoil the parties, and make the evening pass as stupidly as if it were a funeral, rather than merry-making.

And here is a picture of one of the young dandies of Hobart Town:

'One of the W—s dined with us—a conceited, empty-headed young man—all shining in silk stock, with silk lining to his coat, satin waistcoat, and oily hair, together with a liberal sprinkling of gold pins and chains. These Colonial chaps—"Gumsuckers", as they are not inappropriately called—are my aversion—puffed up with the success of his father, since he quitted the boot and shoe line in England—without education, or manners, having no ideas beyond a partial and faint glimmer of something supplied by another—without conversation and without the slightest knowledge of his defects.' . . .

Then comes an entertaining description of a sitting of the Court of Quarter Sessions, presided over by Mr. Joseph Hone(1); (Master of the Supreme Court):

'He appears to know as little about the Law as any of us. He is extremely slow and tiresome. The diabolical faces that he is constantly exhibiting, the awkward, abrupt manner of addressing the witnesses, Counsel, and prisoners—the contraction of the fingers of the right hand, while at the same time his arm is raised as though he was about to claw the Crown Solicitor's pate—altogether he is the constant laughing-stock of the people, many of whom go to the Court for no other purpose than the amusement afforded by the Chairman, which occasionally is quite equal to that of Punch and Joan.

(1) The following Inscription is to be found on the Tomb of Joseph Hone in St. David's Cemetery.—'For the period of 37 years he held various important judicial and magisterial appointments in this Colony. of which he discharges his duties with exemplary industry and ability, and spotless integrity. In private life he was an example of the domestic virtues of unenlightened and Christian charity. *In pace quiescit*'

The witnesses—a Mr. and Mrs. M— of New Norfolk—each weighing about 23 stone, came by separate vehicles, being too bulky to travel in the same gig. Hannah Shaw—tall, thin, and scraggy—common, evidently, by birth rejoiced in the interior of a straw bonnet of most ample dimensions, tastefully, and somewhat elaborately, decorated with deep blue ribbons. A shawl was thrown carefully over her shoulders, resplendent with flowers of gold and scarlet. 'She knew Mr. M's stockings by the size; they would not fit anybody else—she never washed such large stockings as Mr. M's.' . . . Another case for stealing a handkerchief:

'The Prosecutrix—one of Egypt's dark daughters—with sharp features, appeared in a white cap, secured under the chin with a black riband. A Mrs. Elizabeth Clark was very politely handed up to the witness box by her husband. The lady, who had been unhappy in the preservation of her teeth, wore a light dress, richly flowered—the upper portion concealed by a black silk veil and tippet. She had on a straw bonnet, tied with pink ribbon, white gloves, and a Cambric pockethandkerchief in her hand. A parasol with a mother-of-pearl handle completed her equipment.' . . .

Of the general tone of Society he has little good to say:

'The people of this Colony very much resemble the Americans in their presumption, arrogance, ignorance, and conceit. They believe they are the most remarkable men on the Globe, and that their little Island "whips all Creation". They are all Radicals of the worst kind, and their children are brought up in the belief that all Governments are bad—that they are deprived of their rights, and that they are ground and depressed by the Mother Country, and mocked by the Officers sent out from England to rule them. Their views are all of the narrowest and most selfish kind. They are incapable of any generous sentiment, and ever ready to impute the basest motives to their fellow colonists. Lying, slandering, envy, hatred, and malice are their daily aliment, and the consumption is incredible.'.

Duelling had not altogether gone out of fashion in those days, and he gives us an amusing description of one such encounter:

'Murray—an old, brave military officer . . . . appeared on the ground in a *shooting jacket*—certainly a very appropriate dress.

His antagonist (Moore) in *deep Mourning*—equally appropriate, as signification of his feelings. The latter had made his Will, and on his way to what his apprehension looked upon as a field of slaughter, earnestly commended his wife—six feet high—and his two sons and three daughters, fast rising to the same altitude, to the care of the little Doctor' (Bedford) . . . 'Moore had the first fire, took it, and missed. He had then to wait a second, with evident anxiety, while Murray deliberately raised his pistol, took his aim, and sent the ball with a crack—into the stump of a tree, a yard or two distant from his opponent. This caused Moore to jump, not being quite certain whether the deadly bullet had entered the body of the tree, or *his own* . . . . Moore expressed himself as quite satisfied with the result of the hostile meeting, and left the ground a different man from that he had come.'

CONCLUSION

We must bid farewell to this absorbing Commentary on Old Van Diemen's Land. I cannot close its pages, however, without quoting a passage, which reveals an aspect of the writer's character, of which we have hitherto heard little. It is his rhapsody over the view from the top of the Domain at Hobart:

'I looked down' he says 'upon my own residence, and could see my children nay, hear their glad voices, as they pursued their mimic games through the walks of the garden . . . .

The sun was sinking fast behind a lofty hill upon my left, throwing golden gleams upon the green ridges of the cultivated grounds that were already draped in the mantle of Spring, and upon the precipitous masses of rock and wood-covered wilds that bound the opposite side of the river. Before and beyond the tongue of land that forms the Government Domain, the placid water lay deep below, without a ripple upon its surface. The course of the stream was traced for miles, here and there showing its cool, silver face as it made its tortuous way among the island-looking shores, till it was lost in the blue, conical hills, that with their tender outline terminated the view. A fine mass of shadow, lay beneath the sunny sky, broken here and there, by the cold green fields, from which the light of day was fast receding, and by the thin blue vapour that crept lazily up from beneath the trees, masking, here, the Mansion of the rich Banker who holds pecuniary dominion over a moiety of the Island, and there the splendid Asylum, which a humane and wise Government has erected for the young and destitute orphans . . .

A few years since, the sun went down as gloriously, the waters were as placid and silvery, the air as soft and balmy. Mountains and valleys were in the positions they now occupy; but the foot of civilized Man had never trod the gloomy, interminable forest. Nature had then, apparently, been lavish of her treasures in vain—the Kangaroo, the Emu and the Opossum afforded, perhaps, a precarious subsistence to the native children of the woods . . . . But, if there were less Happiness, according to our notions of its constituents, there was, no doubt, infinitely less Misery.'

The Diary of the Rev. Robert Knopwood, 1805-1808[1]

1805	*Dum Spiro Spero*
1806	Whilst I breath I have hope
1807	*Sic Fortis Hobartia Crevit*
1808	Thus by industry Hobart Town increasd

REVD. ROBERT KNOPWOOD
CHAPLAIN

Hobart Town Derwent River Van Diemens Land January 1 1805 A'sia 1806[2]
3 Feb 1805 Mr Cheese

England 1805	Van Diemens Land. A'sia
January Flatheads	July
February	August
March Mackerell	September
April	October
May	November
June	December
July	January
August	February
September	March
October	April
November	May
December	June

N.B. The difference of Time at Hobert Town Van Diemens Land and Greenwich is Nine Hours forty seven minutes earlier than There.

January 1805 — 1 Remarks Hobert Town River Derwent Van Diemens Land A'sia

Tuesday C. Sign NEW YEAR — 1 am at 11 there was a general Muster of all the Prisoners in the Colony, it being New Year's Day. at 4 pm Mr. Harris and self dind with His Honor Lt Governor Collins, who gave us a very excellent dinner
Lt Lord and Powers had another unfortunate dispute

Wednesday C.S. London — 2 am this morn two men Forshaw and Munden began to put my cottage up at my Garden. At 5 pm all the Civil and Military/except Lt Lord of the Royal Marines were at Mr. Harris Monthly Dinner. Lt Lord being under an arrest by order of the Lt Governor.

(1) Prepared for publication by W H. Hudspeth and S. Angel from the original manuscript in the possession of Miss Mabel Hookey, Rokeby, Tasmania.

(2) Page headings sometimes extend across two pages. When this occurs they have been consolidated. When they occur in the middle of a paragraph they have been omitted. (Edd.)

Thursday C.S. Justice	3	am Mr. Harris and self engaged in taking Examinations. At 2 pm I walkd to the Farm and returned home to dinner at 5 pm at 10 some lightning from N.E./At 4 am; the House of Joseph Michael a Jew caught fire and was consumed.
Friday C.S. Herdsmans Cove	4	am at 10 Mr. Fosbrook and self went in my boat to the opposite side of the river. At 5 pm Mr. Fosbrook and George Collins (the Gov. son) dind with me.
Saturday C.S. Berry Head	5	am moderate and fair. At 1 pm I took a stake with Mr. Fosbrook and we went across the river. A Pigeon shooting I killd 4 Mr. Fosbrook Servt 2. in the Eve we returnd.
Sunday C.S. Brixham	6	am the Wr so very hot that Divine Service could not be performd. At 4 pm I dind with His Honor the Lt Governor and in the Eve calld upon Mr. & Mrs. Groves The Thermomiter at 12. 87. ½
January	th 7	Remarks Hobart Town River Derwent Van Diemens Land
Monday C.S. Sandwich	7	am at 7 Mr. Groves and the Gov Son breakfasted with me. At 8 we walkd to Mr. Millers Farm where I had 2 men cutting watling. at 12 I brought the sticks down in my boat 5 pm Messrs. Harris Janson, Bowden and self dind with Mr. Fosbrook.
Tuesday C.S. Dunnoge	8	am Employd about my House and Garden Ground.
Wed. C.S. Yarmouth	9	am The day very hot, at 12 the Thermomiter was 91; ½ 2 pm the Governor and self walkd to the Farm where we dind and in the Eve returned home. 8 Thunder and Lightning with Rain. The Governor gave the Name of the Town at the Farm New Town
Thursday C.S. New Town	10	am the day very windy with rain at intervals. the Eve very cold.
Friday C.S. Monckton	11	am the day very hot with a N.W. wind. at 2 pm Mr. Groves and self went to Risdon in my boat and on return we landed on the Farm side and walkd home to Dinner very late Mr. Clark gave me 2 coucumbers which we had for Dinner at Mr. G's
Saturday C.S. Shoreham	12	am the day very hot 3 pm Mr. Hambleton dind with me. At 5 Mr. Harris informd me of a letter that had passd between him and the Lt Governor

Sunday C.S. Weymouth	13	am at 11 I performd Divine Service and Preach the Sermon on Discontent Censure. after which the Governor returnd me thanks before the whole congregation for the excellen sermon at 5 pm I dind with Lt Johnson
January 1805		Remarks Hobert Town River Derwent Van Diemens Land
Monday C.S. Exmouth	14	am at 7 the Governors Servt came and informd me that there was a ship in sight. 10 Mr. Humphry Mr. Janson and self went in my boat across the River where we see her lay at anchor below Ralphs Bay on the east side of the river 1 pm the Captain came on shore and waited on the Governor 3 the Gov sent for me and invited me to dinner to meet the Captain whose name is Barber the ship name Myrtle. An extra East India ship from Bengall. laden with spirits rice and Sugar. This day we have been two years on the Establishment.
Tuesday C.S. Barber	15	am at 11 Mr. Groves and self went in my boat across the river to see for some Thatch for my house at 2 pm we returnd and the Gov was askd me to meet Capt Barber but I was engaged Lt Johnson and his son George dind with me
Wednesday C.S. Lime	16	am at ½ past 7 the Myrtle Capt Barber and extra company ship arrived in the Cove and saluted the Gov. with 11 Guns. Engaged all the Morn upon business as a Magestrate at 1 pm Capt Barber calld upon me, but I was upon business with the Lt Governor. at 4 rain with Thunder and very hot at intervals.
Thursday C.S. Plymouth	17	am Continual rain all night and in the morn exceedingly warm ½ past 3 pm Mr. Harris dind with me, and in the Eve I drank tea at the Governors. Capt Barber there.
Friday C.S. The Queen	18	am the day very hot. at 12 Capt. Barber calld upon me. pm employd very busy about my new House. The Thermomiter 82 in the shade
January 1805		Remarks Hobert Town River Derwent Van Diemens Land
Sunday C.S. Saltash	20	am the morn very windy and rain at 4 pm Capt Sladden Mr. Janson Fosbrook Bowden Humphry and Lt Johnson and self went on board the Myrtle Capt Barber, to take a sandwich at 3 we came on shore and we walkd to the Farm. At 7 Capt Barber Mr. Bowden and self came down in his boat and supd on board
Monday C.S. Penryn	21	am the weather fair and hot. at 4 pm Capt & Mrs Sladden Mr Fosbrook Humphry and self with Lt. Johnson dind on board the Myrtle.

Tuesday C.S. St. Ives	22	am the morn very hot Capt Barber calld on me and we went a shooting for an Hour—3 pm the Governor Capt Barber and self went in his boat to the Government Farm where we dind with the Governor and in the Eve walkd home.
Wednesday C.S. Helstone	23	am this morn I breakfasted with the Gov. and Capt. Barber at 4 pm Mr. Harris and George Collins the Gov son dind with me. at ½ past 11 pm the Gov sent for me when I was in bed and we sat till 2 am upon business. Continual rain all the Eve and night.

Saturday Jan. 19th am at noon showers at 3 pm the Governor and self went in his boat on board the Myrtle Capt. Barber. and he saluted the Gov with 11 Guns we dind on board and Mr. Harris with us at 8 we came away and the Hands were all upon deck and gave His Honor the Governor three cheers when we came away in the boat

State of the weather on Saturday the 19 of January 1805

At 8 am Fair, Wind n. Ther. 79½	At 5 pm Wind n. Ther. 92
At noon Showery, Wind N.E. Ther. 75	At 8 pm Fair Wind N. Ther. 62
At 4 pm Fair, Wind N. Ther 86	

January 1805 Remarks Hobert Town River Derwent

Thusday C.S. Padstow	24	am Very cold weather with rain at 5 pm Capt Barber Mr. Fosbrook the Govnrs son and self dind with Mr. Harris—the Eve very wet and cold.
Friday C.S. Bideford	25	am continuel rain and wet Wr. all the morn. At ½ past 4 Do Wr rain and wind till 12 pm Sent my man to Risdon with my dogs
Saturday C.S. Lundey	26	am rain till 9 am at 11 the weather began to clear up. ½ past 2 pm My man returnd in my boat with 4 Kangaros which my dogs killd at Risdon. 4 Capt. Barber Mr. Harris and self dind with the Governor.
Sunday C.S. Severn	27	am the Morn very cloudy and the Ground so wet after the rain that the Govnor declind having Divine service performd. At 4 pm Mr. Nichols first Mate of the Myrtle and self dind with the Governor.
Monday C.S. Pembroke	28	am the weather more moderate. at 4 pm Captain Barber and Mr. Nichols dind with me.

Remarks Hobert Town River Derwent Van Diemens Land 1805 January

Tuesday C.S. Radner	29	am moderate and fair wr. At 4 pm Capt. Barber and self dind with his Honer Lt. Gov Collins.

Wed— C.S. Monmouth — 30 am at 10 the Masons tild in my Pigeon House the first tild House in the Colony. The morn damp. At 10 the Lt Gov desired me to accompany him with Capt Barber to Sandy Bay ½ past we walked with him there and returnd in his boat. at ½ past 1 pm I found a very unkind letter from the officers by reason that I did not attend a meeting of them that morn. 4 pm I dind with Capt Barber and in the Eve Supd with the Gov. Rain and little Wind.

Thusday C.S. Dolgally — 31 am continual rain all night and morn. at 12 clear. ½ past 1 pm I took a walk with my Gun and killd a couple of bronswing pigeons. 4 Capt Barber dind with me.

February 1—

Friday C.S. Holy Head — 1 am at 9 the Governor calld upon me and we walkd to see my Cottage. at 11 I attended the meeting of the Magistrate upon Whiteheads business. At 4 pm Capt. Barber and self dind with His Honor the Lt Governor.

Saturday C.S. Stafford — 2 am the Wr, moderate. At 11 Capt Barber calld upon me at 3 pm George the Lt Gov Son and self took a walk to the Sandy Bay. I took my gun and killd a partridge 3 Bronswings Pigeons. At ½ past 6 we returnd and he dind with me.

Sunday C.S. Flint — 3 am the morn very hot. at 11 Performd Divine Service. the Gov. and self attended At home all the afternoon and Eve.

Monday C.S. Mano — 4 am The morn very hot. at 4 pm Captain Barber dined with me at ½ past 5 we went in his boat across the River to shoot Pigeons. In the Eve I supd on board the Myrtle. Capt Slad. & Mr. P. Har. refused to act as Magistrates

Tuesday C.S. Burton — 5 am the morn hot at 6 pm a Boat came up with Mr. Collins from his ship the Sophia from Sidney. He brought Feamale Prisoners with him for this Colony

Wednesday C.S. Collins — 6 am the day hot. at 2 pm the Lt Govner and self went in his boat on board the Sophia Capt Collins. the Lt Gov Daughter from Port Jackson came down and was on board when we were there the same Eve all the Feamale prisoners landed. I dind with His Honor the Lt Governor

Feb. Remarks Hobert Town River Derwen Van Diemens Land 1805

Thursday C.S. Wigan — 7 am at 10 I walkd to the Farm with George Collins the Lt. Gov Son and calld at Martha Hay's. This day I was to have dind with the Lt. Gov. but on my return I receivd a very unkind letter from him. In the eve he sent for me

the Lt. Govrnr afterwards repented that he had believed Mr. Collins who was a bad man

and I took tea with him. Mr. Collins of the ship Sophia dind with the Lt Governor—Capt Collins of that Sophia had told the Lt Governor a great many lies which was proved so by Capt Houston on his arrival in H.M. Ship Porpois.

Friday C.S. Rippon 8 am at 10 all the officers upon the Parade this morning at ½ past ten I went to Mr. Harris by request of Governor Collins
The Governor made it up with all the Officers.
Lt Lord came out of his Arrest by order of the Lt. Governor Collins.

Saturday C.S. Wetherby 9 am at 3 dind with Capt Barber and we went over on the other side of the River a shooting. I supd on board and George the Gov son with us.

Sunday C.S. Hornby 10 am at 10 I went to the Farm and performd Divine Service there returnd home to Dinner. The Governor's son dind with me
In the eve I calld upon Mrs. & Mr. Groves

Monday C.S. Sheffield 11 am at ½ past Ten the Magistrates all met at Mr. Harris upon business—myself Capt Sladden and Mr. Harris,—the last two gentlemen having chose to act again. At 4 pm Capt Barber of the ship Myrtle dind with me

Tuesday C.S. Stockton 12 am receivd letters by the Sophia from Capt. Rhodes and Lt. Moore at ½ past 10 the three Magistrates sat on business respecting Andrew Whiteheads ill conduct to Mr. Fosbrook—4 pm I went on Board the Myrtle Capt Barber and dind and supd—the hotest day we have experienced this Season.

Wed— C.S. Morpeth 13 am Engaged all the morn upon business till 1 pm when I went on board the Myrtle to speak to Capt Barber. I returnd home to dinner. At 2 am G. P. H. accompanyd with W. I. Anson came to my Marque while I was in bed. Mr. H. requested that I would marry him as this morn at 8. He was very forward in spirits. I told him that I could not marry him till I had askd the Banns. the Marriage postpond till Sunday next.

Feb. 1805 Remarks Hobert Town Van Diemens Land

Thursday C.S. Shields 14 am at 10 I went on board the Sophia Capt Collins and receivd 2 Quarter Casks of Port Wine and some fruit trees

Friday C.S. Wigton 15 am being very unwell I continued at home all the day. In the Eve Capt Barber came and smoaked a Cherrout with me

Saturday C.S. Cape Barron	16	am at home all the morn. 4 pm Capt Barber and Mr. Nicols his first officer came and dind with me. Mr. Harris calld and took some Wine. Mr. Groves smoakd a pipe with me At 8 the Drum beat to arms. It was supposd that the corn Stacks were set fire to by reason of the great fires. It was only the Natives.
Sunday C.S. Whitby	17	am at 10 I went to the farm and Married George Pirdeaux Harris Esqr to Miss Ann Jane Hobs of Newtown. at 4 pm Capt Barber dind with me, and at 8 pm took leave and went on board. Lt Johnson was sent on board with a party of men as the Lt Gov had information that many of the Prisoners were going to effect their escape by the Myrtle. desertd from the Camp Thos Green James Price James Wright
Monday C.S. Myrtle	18	am at 4 saild the ship Myrtle Capt Henry Barber for Norfolk Island and to the N.W. coast of America. At ½ past 11 Groves and self in my boat went to Risdon for my man and we cut some spars. the wind was very fresh when we came away.
		Remarks Hobert Town 1805 Feb.
Tuesday C.S. Belfast	19	am a Boat returned from the Myrtle with Lt Johnson who went on board on Sunday Eve with a party of Men the Lt Gov. being informed that some of the Prisoners would escape in the ship if possible. At 4 pm the Lt. Gov had all his officers to dine with him. Prisoners absent from the Hobert Town. Tho Green, James Price,—Wright Prior to the Lt. Gov. giving the officers a dinner this day one of them waited upon him and informd him they feard he had forgot his Promise for them to dine with him.
Wednesday C.S. Down	20	am at 11 Mr. Groves and self went in my boat across the river at 5 pm we returnd with a great many poles &c for Building. Frequent showers.
Thursday C.S. Coleraine	21	am Moderate and fair Wr. at 4 pm I went across the water for my Man Gains who was a Kangarroing. he killd a very large one. At 6 pm I went and took a pipe at Mr. Groves Mrs. and Mr. Powers were there.
Friday C.S. Hull	22	am at 10 I struck my Marque and had it Pitched near the cottage. at 4 pm Mr. Groves and his son came past and they took a Kangaroo Stake with me
Saturday C.S. Barton	23	am the day very hot with a N.W. Wind at 5 pm the Government Cutter was sent down to Sandy Bay where the Body of James Price was found. he was seen by the stock keeper
Feb.		Remarks at Hobert Town 1805

Sunday 24 C.S. Trent — am at ½ past 10 the morn was so very hot from a N. West wind that the Lt. Gov declind having Divine Service performd. 2 pm I buried the body of James Price who deserted from Hobert Town on Sunday Feb. 17 in comp with Tho. Green and James Wright. This morn I Breakfasted and Dind in my cottage though not finished the morn was so hot.

Little Nettle had 7 Puppys

Monday 25 C.S. Lyne — am at 10 I married Mich. Mansfield and Sophia Chilvers in my cottage.

Tuesday 26 C.S. Berry — am at 11 by request of the Lt Govnor I went to New Town where I examind Wm. Parish &c. the Lt Gov came to the Farm to me.

Wednesday 27 C.S. Colchester — am at 11 Mr. Groves and self went to Risdon in my Boat where I left my man with my Dogs we dind in the Woods and returnd home in the Eve
the Lt. Gov. D . . . came on shore to remain with him.

March — Remarkes Hobert Town 1805

Thersday 28 C.S. Malden — am the day very fine pm Mr. Groves calld on me

Friday 1 C.S. St. David — am at 9 my Man Gaines returnd from Risdon and killd three Kangarros and 1 Emew—at 5 pm Mr. & Mrs. Powers and Mr. & Mrs. Groves calld upon me. This Eve I sent His Honor a peice of Emew.

Saturday 2 C.S. Dispatch — am in the Morn I sat upon business as Magistrate. pm continued at home writing

Sunday 3 C.S. Grantham — am this morn early the Marque of G. P. Harris Esqr—the Linings of the Marque was cut, when Mr. and Mrs. Harris was in bed and a large Cask of Spirits was taken away. At 10 the Weather was so wet that we had not Divine Service performd.

Monday 4 C.S. Newark — am at 8 this morn the Sophia fird a Gun as signal for sailing at ½ past Lt. Lord and Mr. Humphry went on Board at 11 the Magistrates sat. 12 Lt. Lord and H. came on shore

finisd my letter for England and Pt. Jackson

Tuesday 5 C.S. Patterson — am at 8 moderate and fair Wr. ½ past 2 pm Mr. Groves dind with me and I went out a shooting at 3 came to anchor the Nancy schooner from Pt. Dalrimple. As she came past Oyster Bay she took up 3 men that belonged to

the Sophia that were sealing there. The Natives had set fire to their House and robbd them of their provisions. Had not the Nancy came they must have pershd. The Natives destroyd about 2000 skins which they had taken since they were on the Island.

Remarks Hobert Town March 1805

Wednesday C.S. York Town	6	am the Monthly Club was held at Mr. Bowdens. This day I got a great many Poles for my Garden
Thursday C.S. Good Voyage	7	am at ½ past 10 I went out in my boat to cut some thatch at 11 the Sophia made a Signal with a gun and got under weigh with a fair breeze down the River. At 2 the wind changed and drove my boat a shore, loaded with Rushes, and with very great difficulty We got her off again. We arrivd safe at Hobert Town at 4 pm ½ past 7 my servants Kitchen caught fire and was entirely consumed with a very fine stove and other things lost all my fruit trees in the Garden
Friday C.S. Doncaster	8	am the whole of the Day very hot with a N.W. wind—pm Mr. Groves calld on me the fire the Eve before spoild many valuable plants in my garden and about 400 paling
Sat— C.S. Chester	9	am at day light this morn saild the Nancy schooner for Kings Island at 11 a boat arrivd from the Sophia Mr. Collins. The wind had blown so much that he could not get out of the River. pm every appearance of Rain.
March		Remarks Hobert Town March 1805
Sunday C.S. Thetford	10	am continual rain all the morn. Divine service could not be performd pm more moderate. In the Eve I went to Mr. G. and stayd late.
Monday C.S. Banbury	11	am moderate rains, at 11 sent my Men after 2 Kangarros, pm in the eve they returnd and killd a couple.
Tuesday C.S. Harwich	12	am at 11 I walkd to the Farm and returnd home late to dinner
Wed. C.S. Thames	13	am very busy about my garden
Thursday C.S. Kingston	14	am this morn I breakfasted in my Cottage and employd in removing some of my things there. at 11 I went across the water with my boat to put Gains with my Doggs across. Mr. G.—and self dind in the Woods. we returnd at 6 pm

and this Eve I slept at my Cottage for the first night having been sixteen months three weeks and five days in my Marque exposed to the inclemency of all Weathers, not only that but a Marque which when we had them first were not new. Add to it; the continual Robberies which were daily Committed in the camp by the convicts and the servants all of which I was subject to.

March — Remarks Hobert Town River Derwen

Friday C.S. Shaftsbury 15 am this morn the Spirits were issued to each officer the quantity that the Lt Gov. allowd them to take. pm the Masons &c being very busy about my House I went to Mr. G. and in the Eve came there Mr. & Mrs. P. and Miss Collins, afterwards His Honor the Lt. Gov. He took a glass of Spirits with us.

Saturday C.S. Dublin 16 am at 11 Mr. Groves and self walkd to the Farm. at 4 pm we returnd and he dind with me.

Sunday C.S. Ireland 17 am the morn cloudy at 11 Performd Divine Service His Honor Lt Gov Collins attended the Sermon on Conscience 12 Chapt Hebrews 24 verse, in the afternoon Mr. & Mrs. Groves calld upon me.

Monday C.S. Ulster 18 am at 11 Mr. Harris and self engaged upon Business.

Tuesday C.S. Leitrim 19 am at 10 I walkd to the Farm and returnd to Dinner. pm at 7 I went down to Mr. Groves and met the Lt. Gov. there.

Wed. C.S. Collins 20 am at 7 His Honor the Lt Governor and Mr. Harris the Surveyor went and examind a peice of water near Frederick Henry Bay. at 2 pm they returnd and at 5 when I calld for the C. Sign the Lt. Gov. invited me to his House where I set some time.

Remarks Hobert Town River Derwen

Thursday C.S. Wexford 21 am at 10 Mr. Groves and self walkd to Millers the Setlers—I return at 4 pm to dinner.

Friday C.S. Cork 22 am at home all the morn pm very warm weather.

Saturday C.S. Longford 23 am this morn sent Salmon and Gains out with my Dogs and they returnd at 9 with a couple of Kangarros at 10 engaged upon Business. At 3 pm I deliverd the report in to His Honor the Lt Gov. when he was walking at Mr. Powers Garden with his Daughter and Mr. P. the Lt Gov asked me to do duty at New Town.

Sunday C.S. Clare	24	am at 10 I went to New Town and performd Divine Service and returnd—I stayd at home all the aft and eve, fearful that my Kangarro Dogs should be taken away It was the intention to robb me of my dogs.
Monday C.S. Shannon	25	am this morn was missing from Hobart Town the following Prisoners—James Ballance, John Rogers, Henry Rice, Robt Hays, Richd Kidman—they took away some Doggs pm in the eve I spraind my ankle very much
Tuesday C.S. Kerry	26	am at home all day with a bad ankle
Wed— C.S. Castlebar	27	am at home all day—pm at 11 the wind began to rise which increasd very much
March 1805		Remarks Hobert Town V.D.L.
Thursday C.S. KilKenny	28	am at 1 it blew a very hard Gale of wind which continued till 6. At 8 more moderate. pm at 4 moderate rain.
Friday C.S. Trim	29	am at 1 pm I took my boat and went across the River to cut posts for Railings
Saturday C.S. Athlone	30	am at ½ past 11 this morn and at 2 pm but more perticularly at 2 Mr. G . . . s thought he felt his House shake similar to an Earthquake.
Sunday C.S. Ross	31	am the Wr. rainy at intervals that Divine Service could not be performd.
April 1805		Remarks Hobert Town V.D.L.
Monday C.S. Dundalk	1	am at ½ past 10 Mr. Harris and self went to the Farm upon business. I returnd to Dinner late. pm the Governer din'd with Mr. Fosbrook the Commissary the first time that he dind with any of the Officers of the Colony.
Tuesday C.S. Massey	2	am at home all the day
Wednesday C.S. Duncannon	3	am at ½ past 10 I went to the Farm with the Governor to inflict punishment upon some men, and returnd to dinner. Martha Hays was brought to bed of a Girl this eve at ½ past 11
Thursday C.S. Valentia	4	am at 10 I sent Th's Salmon to the Farm dismissd him from my service and took Tho Stokes as a Servt

Friday C.S. Kinsale	5	am at 11 I walkd to the Farm to see Marth Hays and returnd home to dinner.
Saturday C.S. Cape Clear	6	am People employd in clearing my Ground
Sunday C.S. Kilmore	7	am at 11 Performd Divine Service. the Lt. Gov., &c &c. attended. in the aft Mr. & Mrs. G. call upon me and took Tea

Remarks Hobert Town, River Derwent, V.D.L. A'sia.

Monday C.S. Donegall	8	am at 11 I walkd to the Farm and everything at a stand for want of rain. The grass parchd up and all our Gardens
Tuesday C.S. Sky	9	am at home all day seeing to my Ground being cleard At 1 pm the Country from the Gov. Farm to Sandy Bay all on fire by the Natives.
Wednesday C.S. Pentland	10	am at 11 I walkd to the Farm
Thursday Elgin	11	am at 11 I waited on the Governor who ordered me some Bricks
Friday C.S. Murray	12	am this day being Good Friday it was keept Holy at 11 all the Military Setlers Male and Feamale Convicts attended Divine Service. The day was remarkably fine.
Saturday C.S. Fort George	13	am at home all the morn upon Business. This Morn I married Mr. Clark the Head Masoner to Mary Ginnins free people. At 2 pm I took my boat and went a Fishing and had very great success.

Remarks Hobert Town V.D.L. April 1805

Sunday C.S. Gee	14	am Easter Day at 11 His Honor the Lt. Governor &c. &c attended Divine Service, the day very fine.
Monday C.S. Blair	15	am At 10 Mr. Groves and self went across the River to get some Rails and we left 2 Men Tho Salmon and his Man to cut Rafters &c for his house. We returnd home in the Eve
Tuesday C.S. Tay	16	am this morn My man returnd with 3 large Forest Kangarros pm at 5 Native fires for a great distance on the oposite shore.

Wed. C.S. Dunbarton	17	am at 9 Mr. Groves and self went to his men who were cutting wood for his House and from thence we walkd to Risdon. 4 pm the wind so strong against us that we were obliged to run* to the Farm and leave the Boat there walk home.
Thursday C.S. Dundee	18	am at home all day busy about my Garden
Friday C.S. Glasco	19	am at 11 I went across the water for some rails and returnd to dinner
Saturday C.S. Hamilton	20	am at 11 Mr. Groves and self went to the other side of the river for his men who were cutting Trees for him and My Man brought there the largest kangarros that has been killd. Neither Salmon nor Gains could [ ](1) it without dividing same

Remarks Hobert Town V.D.L. Asia

Sunday C.S. Dalkeith	21	am at 11 I went to New Town and performd Divine Service
Monday C.S. Douglass	22	am at home all the Day
Tuesday C.S. St. George	23	am at 8 this morn the colours were hoisted it being St. Georges Day. at 11 I went in my boat to Herdsmans Cove and took my Kangarro Dogs with me in the eve I went out and killd one Kangarro the only one I saw slept in a Tent there Mr. Hays was with me. In the Eve I was lost for some time owing to the Distance the Kangarro took me.
Wednesday C.S. Dumfries	24	am Early this Morn My Man killd 3 Kangarros—I went out afishing and caught some very large rock codd I slept there again
Thursday C.S. Wigton	25	am this morn my Man killd an Emew and unfortunately lost my Dogs. At 1 pm Mr. Hays and self &c but my Man got into the boat and left the Cove for Hobert Town At ½ half past 5 I got home to dinner. In the eve I went to speak to Mr. Groves and on my return the Gov calld me to him where I stayd sometime I sent the Lt Govnr the young Emew this day 2 years we saild from Spit Head the Ocean Transport in company with us. Capt Mertho owners the Hurrys

Remarks Hobert Town V.D.L. 1805 April

* ? row.

(1) Illegible (probably 'bring').

Friday C.S. Supply	26	am at home all the day. General Orders Government House Hobert Town April 26. 1805 The Commissary will on Tuesday next issue until further orders the following Rations weekly. 3½ lbs Beef. 6 lbs Flour—6 lbs of wheat. 6 oz. of Sugar.
Saturday C.S. Carlisle	27	am at 11 Mr. Groves and self went up the river and caught some very fine Rock Codd My Man returnd with my Dogs and brought a very fine Emew and Kangarro
Sunday C.S. Solway	28	am at 11 performd Divine Service attended by His Honor Lt. Gov. Collins &c &c.—Mr. & Mrs. Groves Drank Tea with me.
Monday C.S. Kilmore	29	am at ½ pas 11 I met the Lt Gov and Mrs. Powers, she told me that they were coming to my house to speak to me, Gov said that he could not make it conveniant to go to the Farm and have Martha Hayes Children Xtiand. I asked Him if he did not mean to stand for the child. his answer was, no, but requested that I would go there. I walkd and of course found them unprepared with God-father and G.Mothers as the Lt Gov had promised to stand for the child and Mrs. Powers. Mr. Groves calld upon me in the eve.

Remarks Hobert Town V.D.L. May

Tuesday C.S. Bute	30	am at 11 Martha Hays and Mother calld upon me. At 1 pm Mr. Groves and self went up the River and pitchd the tent beyond Risden
May Wed. C.S. Clyde	1	am at 7 we breakfasted and walkd to the Coal River near Frederic Henry Bay. the distance was 12 miles across a very bad country very bad walking. we see many Kan-garros and Emews Owing to the tide coming up we could not see any coals &c &c.
Thursday C.S. J	2	am at 8 this morn we got into my Boat and went to Herdsman' Cove Many of the Natives were all around and the Country in fire. in the eve we had a great deal of rain
Friday C.S. Aberdeen	3	am much rain which continued till 12 at 11 we got into the Boat and at ½ past 3 pm arrived at Hobert Town.
Saturday C.S. Kenyard	4	am fine mild Wr with gentle showers of Rain, at 11 I dis-coved a very daring Robbery which John Earl My Gardner had committed upon me by breaking into my Closet. I found Brandy and some Pick lock Keys upon him.

1805 Remarks Hobert Town V.D.L. May 1805

Sunday C.S. Hay	5	am the Weather so damp that divine Service could not be performd.
Monday C.S. Keith 500 Lashes	6	am engaged this morn in committing John Earl for robbery. he broke into my house and stole some Spirits and for which he was ordered by the magistrate— I sat up the Bench to try 4 Prisoners who robbd the Stores of Flower
Tuesday C.S. Bruce	7	am this Morn my Man that Robbd me receivd part of his punishment of the 500 lashes—, at 1 pm I walkd to the farm home at 5 to dinner. I heard a Whale in the River this Eve.
Wednesday C.S. Detect This day I see a large Whale in the river opposite the Hobert Town	8	am at 11 a party of the Prisoners that were going away with a new Whale Boat were detected and confind, I went out afishing afterwards and had very good success. Mr. Harris and Janson went down the River to Frederic Henry Bay to survey a piece of water there calld Pitt Water.
Thursday C.S. Harris Parole Pitt Water	9	am at 11 His Honor the Lt Governor Revd. R. K . . . d and Wm. Sladden Esqr, set to examine Samuel Gun alias Camel Chris. Forsha—alias Watkins—John Williams alias Johnson—Munden—Hayward Horne Prestige Avery. Prisoners that were going to take the new Whale boat and make their escape in it to New Zealand. Although the information was so true that we receivd yet could not get anything from them to convict them Rain all day and in the Eve.
		Remarks Hobert Town Van D.L. May 1805
Friday C.S. Fife	10	am dark cloudy Wr. I went out afishing very little success
Saturday C.S. Dunbar	11	am at 11 I went down the river in my boat aFishing Caught a Parrot fish Rock Cod and others returnd home at 5 pm Ponto was lost
Sunday C.S. Wallace	12	am the weather so Damp that Divine Service could not be performd. at 5 pm Mr. Harris returnd from Pitt Water
Monday C.S. Darnley	13	am at 11 a strong Breeze and at 4 pm it blew very hard which continued all night at 11 pm a perfect gale of wind.

Tuesday Douglas	14	am at 9 moderate and fair wr. at 11 I went aFishing very little success this day I had a very fine peice of Roast Pork for dinner sent me by order of His Honor Lt Gov Collins
Wednesd C.S. Howard	15	am at 11 I went across the River to put my man after Kangarros. Caught some very fine FlatHeads
Thursday C.S. Erskine	16	am at 7 it—began to rain which continued all day at ½ past 1. pm I went afishing and had very good success Returnd to dinner at 6 pm Continual rain.

Remarks Hobart Town V.D.L. May 1805

Friday C.S. Crawford	17	am at home all the day. pm the wr. very fine this day some of the prisoners began to Exercise the Great Guns—in readiness for the 4th of June.
Saturday C.S. Percy	18	am at 12 I went afishing and caught 38 Rock Cod, some very large and 5 Perch and some Flat heads in all about 60 Fish and returnd home at 5 pm to dinner.
Sunday C.S. Lenox	19	am the Winter being now and the ground being so damp that Divine Service could not be performd pm the afternoon very fine
Monday C.S. Maitland	20	am at 11 engaged upon the Bench afterwards at home all the day
Tuesday C.S. Forbes	21	am at 10 the Weather remarkably fine Vanstrutton employd erecting my Kitchen Chimney and Oven and Stove at 11 I went out afishing and caught a very large Crayfish, the first that was taken in this Colony which I gave to His Honor the Lt. Gov. on my return home to dinner late in the eve rain and wind.
Wed C.S. Mackenzee	22	am much wind this morn at 11 went out a Kangarroing home at 4 to dinner
Thursday C.S. Maxwell	23	am at 11 I went out afishing on the east side of the River at 12 it began to blow very fresh I continued there till ½ past 3 pm the wind increasd but I venterd over with one man and self Gains my keeper, the Black Cutter that went with Capt Flinders safe so many leagues at sea was obliged to put back at 7 much lightning and a hard gale. 8 heavy rain, 11 blowing very hard from the S.W. 12 down

Remarks Hobert Town V.D.L. May 1805

Friday C.S. Cullen	24	am all the officers receivd 10 gallons of Spirits this Morn Mr. Harris and self sat upon the Bench at 1 pm I walkd to the Farm and home to Dinner.
Saturday C.S. The Plough	25	am this Morn Rain at 11 I sent my men Gains and Jones in my boat up the River after Kangarros ½ past 12 Capt. Sladden and self sat upon some business respecting Mr. Harris Man Kerhoe
Sunday C.S. Mar	26	am at 10 fine weather but cold divine Service could not be performd My Man returnd with three very large Kangarros
Monday C.S. Nevil	27	am at home all day a great many Whales in the River non bene
Tuesday C.S. Boyd	28	am at home all the day. Non bene
Wednesd C.S. Castle	29	am at home 2 pm I went out afishing and caught some very fine Pirch. Rock Cod and a Crayfish, Returnd late to dinner.
Thursday C.S. Rochester	30	am at home all the Day
Friday C.S. Brompton		am at 12 I went in my boat afishing and caught a Crayfish weight 6 lbs. came home to dinner

Remarks Hobert Town V.D.L. June—1805

Saturday C.S. How	1	am at 11 I went in my boat to Risdon and walkd home from the farm to dinner got some Quails—sent my man a Kangarroing and Jones, I came home to dinner.
Sunday C.S. Victory	2	am moderate wr but cold and very damp At 4 pm my man returnd from Risdon and brought home three large Kangarros 1 of 120 lbs, 1.80—1.70—in the eve I went and supd at Mr. Groves I carried them a Crayfish which I caught weight 7 lbs this day aged 43. years.
Monday C.S. Rejoice	3	am at home all day this morn I Christian Mr. Bowden's child
Tuesday C.S. The King	4	am It being His Majesty's Birth day, was a Holiday throughout the Colony at ½ past 11 the Military Paraded and at 12 a Royal Salute 21 Guns were fird. At 2 pm His Honor the Lt. Gov. gave all the Prisoners ½ a Pint of

Spirits 5 pm His Honor gave a dinner to all the Officers Civil and Military and the Eve concluded with a large Fire and other demonstrations of Joy Cap. S . . . has a Government mare[1] which he uses to harrow his ground.

Remarks Hobert Town June 1805 V.D.L. Asia

Wednesday C.S.	5	am at 11 Mr. Groves and self went to Risdon in my boat and there we dind and stayd all night.
Thursday C.S. Durham	6	am at 12 we left Risdon and came to Hobert Town
Friday C.S. Tyne	7	am at 11 Engaged all the morn upon Business and Mr. Harris with me My man returnd from Risdon.
Saturday C.S. Trent	8	am the wr fine at 2 pm I went across the River and caught 4 very fine Crayfish. In the Eve sent His Honor the Lt Govnr one
Sunday C.S. Hope	9	am at 9 I was informd that there was a Ship in Sight at 4 pm a Boat Returnd and informd us that it was a Whaler the Richd and Mary.
Monday C.S. Arrival Lucas and Spencer & Co [ ][2]	10	am this morn the whaler came opposite the Town, the whaler Richard and Mary out 18 months from London. Captain Lucas owners of the same name she came last from Sydney and engaged in the house with Mr. Cambel and Wm Collins—late of Hobert Town

Remarks Hobert Town June 1805—V.D.L. Asia

Tuesday C.S. Camden	11	am this day I began to sow some wheat. At home all the day
Wednesday C.S. Melville	12	am at 10 Mr. Groves and self went in my boat on board the Richd and Mary Whaler, to buy some sheep—but could not they were too dear—in the eve returnd to dinner
Thursday C.S. Strachen	13	am at home all the day busy in sowing wheat
Friday C.S. Smith	14	am engaged all the morn upon the Bench at 5 pm a boat came up the River from the Good intent Schooner, Mr. Kelly, Commander from Kings island

(1) 'mare' (query 'man').
(2) Illegible (probably 'London').

Saturday C.S. Humber	15	am Early this morn the 5 prisoners that went away on the 25th of March at 2 pm George Collins the Lt. Gov. Son and self went across the River in the Eve he dind with me. I sent the Lt Gov. a Crayfish
Sunday C.S. Recovery	16	am the weather cold not able to have Divine Service performd at home all the day

Remarks Hobert Town V.D.L. asia.

Monday C.S. Eden	17	am at home all day
Tuesday C.S. Dacres	18	am engaged all the Morn upon business examining the 5 Prisoners that went into the Bush They informd me that on the 2 of May when they were in the wood they see a large Tyger that the Dog they had with them went nearly up to it and when the Tyger see the men which were about 100 yards from it, it went away. I make no doubt but here are many wild animals which we have not yet seen
Wednesday C.S. Scott 12 Piggs	19	am this morn my Man came back from Kangarro Hunting and had very great success Killd 3 large Kangarros and 2 very large Emews My little sow had young Piggs. at 4 pm the Governor Hunter Schooner from King Island anchord in the Bay.
Thursday C.S. Oyster Bay	20	am at home all the morn 3 pm it began to rain ½ pas Mr. and Mrs. Groves and son dind with me the eve very wet

June 1805 Remarks Hobert Town V.D.L. Asia

Friday C.S. Africa	21	am Continual Rain all this morn pm Do Wr and very cold. Wind South 8 pm
Saturday C.S. Dickson	22	am at 9 do. wr. The Table Mountain was coverd with snow. At 11 sent my Man to Herdsmans Cove with my Dogs.
Sunday C.S. Bronte	23	am the Morn very cold and wet. At 7 pm My Man returnd in my Boat from Herdsmans Cove with 2 very large Emews and 3 large Kangarros.
Monday C.S. Montross	24	am at 8 I was informd that six men had deserted from the Camp. Steward, Carmical, Wright, Morris, Fernander and Camel and had taken my boat with them and the Government Oars—Camel & Fernander took my boat away to the Point where they had planted something

Tuesday C.S. Elden	25	am at home all the day. busey upon Wades Business pm I see Henry Hakin upon the Business of Stewarts &c going away.
Wed. C.S. Cole	26	am saild this morn the Schooner and a party of Marines with Hakin in it the morn wet. pm do. wr.
Thursday C.S. Clarence	27	am at 11 I walkd to the farm Mr. Hamilton returnd and dind with me
Friday C.S. Bate	28	am at ½ past 11 I walkd with my Gun towards Sandy Bay killd four very fine Lorket Birds and 3 Pigeons returnd to dinner at 5 pm

Remarks Hobert Town V.D.L. 1805

Saturday C.S. Hood	29	am my people employd in breaking up Ground and fencing in my Land. Sent my Man out with my Dogs on the East side of the River pm at 1 I took a walk to Sandy Bay and took my gun Killd some Ground Pigeons very much like the Pigeons in the West Indies
Sunday C.S. Winne	30	am the Morn fine but very damp after the quantity of Rain My Man returd home with 1 Emew a large Kangarro
Monday July C.S. Darnley	1	am the Whale Boats brought a Whale which they had killd in Storm Bay
Tuesday C.S. Scorpion	2	am at 11 I went on board the Richard and Mary Whaler Capt. Lucas they had finishd cutting the Whale It was very large. 5 pm at 5 the Gov's son dind with me The time twelve months the River was full of Whale.
Wed. C.S. Mitford	3	am at home all the Day at 6 pm I walkd down to Mr. Groves, and the Lt. Gov. came and set there till 9.
Thursday C.S. Redesdale	4	am at 9 George Collins the Lt. Gov Son Breakfasted with me and we walkd to Sandy Bay, at home all the aft this morn 2 loads of tiles came for my House.
Friday C.S. Graves	5	am the morn very beautiful At home all day
Saturday C.S. Bedford	6	am at 10 My Man returnd from kangarooing. He killd 4 he gave 1 to Capt. Lucas ship Richd and Mary pm the Day very cold I walkd to the Farm, many of the Prisoners applyd for Kangeroo the Pork being so very bad and only 2 lb 10 oz a week. A very severe frost this morn the Ground coverd with frost.

July 1805 Remarks Hobert Town V.D.L. Asia

Sunday C.S. Somerville	7	am a very severe frost again pm at home all the day in the eve Mr. G . . . s calld upon me.
Monday C.S. Windsor Castle	8	am very cold this morn pm at 3 a little rain 4 we heard it Thunder at a distance
Tuesday C.S. Mars	9	am at 11 I went to the Farm upon business and Mr. Harris met me there. Lt Johnson Mr. Janson Surgeon was there Lt. Johnson sent three men out with his Dogs aKangarooing.
Wed. C.S. Pawlett	10	am early this morn the wind was very high and at 9 the mountain was coverd with snow. The day very cold at 7 pm blowing hard from the S.W.
Thursday C.S. Pringle	11	am early this morn blowing very hard with snow from the S.W. at 8 do. wr. the day very cold pm do. wr. this eve we had an Eclipse of the Moon.
Friday C.S. Mermaid	12	am at 12 I waited upon His Honor and askd for Bowder &c and he informed me that he knew nihil of Steward going away. vide.
Saturday C.S. Fishery	13	am engaged upon business all this morn at 4 pm Henry Hakin and the 4 Soldiers return with the men that deserted in my boat.

July Hobert Town Van Diemen Land

Sunday C.S. Island	14	am at 12 I took a walk to the Gov. Farm.
Monday C.S. Archer	15	am at home all the morn till 12 when I went ashooting after seeing Henry Akin
Tuesday C.S. Algiers Camel & Fernander took my boat away from the Moorings	16	am this morn Mr. Harris and self were upon business all the morn and we expected the prisoners Stewart &c that went away with my boat to be brought before us pm blowing very fresh from the NW at 4 pm we had information that a ship was seen off Storm bay Passage ½ past Henry Hakin went with one of the Govmt. Boats down the River. 7 a fire broke out at the House of Francis Cobb a Prisoner which consumed the same in a short time It is very remarkable that we have alway had a fire, when a strange sail has been in sight, or very near the Derwent.

Wed. C.S. King George	17	am at 11 the Boat which took Henry Hakin to the Ship Returnd and brought many letters from England. We were informd that the Ship's name was the King George Whaler from Sydney belonging to Cable and Underwood olim prisoners at Sydney. I had letters from Salisbury &c

July Remarks Hobert Town V.D.L. Asia

Thursday C.S. Argo	18	am at 10 Rain in the morning Early it blew very fresh from the S.W. 12 the King George Whaler working up the River wind N.W. at 3 she anchord opposite my House.
Friday C.S. George	19	am at 11 a large Whale opposite my House and Two Boats from the King George Whaler after her. They killd the calf, but she went down immediately. They did not kill the Cow. at 2 pm I took a walk to Sandy Bay and see some Pigeons, it is remarkd that the Bronswing Pigeons have not left us this winter, which shows it is not so severe as last.
Saturday C.S. Woodriff	20	am at 9 the Boats were after Whale in the River at home all the day
Sunday C.S. Legg	21	am at 10 the King George Whaler went down the River from Sullovan Bay. the day very fine but cold. the mountain coverd with snow. at 8 pm we obserd some Native fires towards Risdon.
Monday C.S. Dundass	22	am 10 very cold at home all the morn
Tuesday C.S. Edgeware	23	am at 7 we had a little Rain and very cold 2 pm a ship appeard standing up the River. at 4 pm she arrivd and anchord in the bay the Sophia Capt Collins from Sidney

July 1805 Hobert Town Van Diemens Land Asia

Wed. C.S. Sophia	24	am at home all the day
Thursday C.S. Argo	25	am this morn a sharp frost. The vessels that are a Whale fishing here are the Richard and Mary Whaler, Capt Lucas of the house of Lucas and Co. London King George Whaler Capt. Moody owners Lord Cable and Underwood Sidney, Sophia ship Capt. Collins, owner Camel Sidney, the Recovery schooner Capt. Kelly belonging to the house of Camel
Friday C.S. Fitzroy	26	nr am this morn I waited upon His Honor Lt. Gov. Collins vide 4 pm Capt. Lucas of the Ship Richard and Mary whaler and Mr. Groves & Son dind with me

Saturday C.S. Orde	27	am at 11 His Honor the Lt. Gov. took Kangarro into the store at 1 shilling per lb. After the selling this morn I walkd to the Farm.
Sunday C.S. Shipley	28	am at home all the day a great many whales in the River beyond Hobert Town
Monday C.S. Moore	29	am this day I got some more wheat in and the Men employed in chipping it in.

1805 Hobert Town Van Diemens Land July

Tuesday C.S. Halloway	30	am My Men employd in breaking up more Land I took Mr. Clark's Boat out for the first time afishing in the Bay
Wed. C.S. Hervey	31	am at 11 I walkd towards Sandy Bay to kill a few Wattle Birds in coming home I see a Kangarro and set my Nettle at it she drove it down towards me, I shot at it and killd. 4 pm calld on Capt. Lucas who informd me they had killd many Whales at Frederic Henry Bay. at 10 pm his ship anchord opposite the Town
Thursday C.S. Paget	1	August 1 1805 am this morn at 7 it was a sharp Frost. at 1 pm I took a walk to the Government Farm
Friday C.S. MacKenzie	2	am at 11 I took a walk and met my man who came down In Clark's Boat from Herdsman's Cove having killd 2 Kangarros and 2 Emews at 3 pm Mr. Lucas's Men caught a large Whale near Hobart Town and while they were towing it to the ship a Whale was aground opposite my house upon the shore but got off again. Not a Glass of Spirits in the Colony to be had.
Saturday C.S. Bombay	3	am this morn I calld upon Capt Lucas. Mr. Collins busy in opening his shop.

August 1805 Remarks Hobert Town V.D. Land

Sunday C.S. Majestic	4	am It raind all the day and much snow upon the mountain at 4 pm
Monday C.S. Aylmer	5	am A very fine morn. Employd all the morn in planting and sowing seeds after the rain The Mountain was coverd with snow.

Tuesday C.S. North 6 am at 9 I went up the River in Mr. Clarks Boat opposite Risdon and returnd to dinner at 5 pm non bene this day we were put on shorter allowance 2 lb 10 oz Pork 2 lbs Flower 2 lbs wheat 2 lbs Meal & not a drop of spirits in the Colony

To R.M. seal 2 lbs 10, [ ][(1)] 6 lbs wheat and 6 lbs flower

Wednesday C.S. Warren 7 am the day very cold at home all day employd about my gardens

Thursday C.S. Diomede 8 am at 11 Rain this morn I sew some grain. At 2 pm the wind was very high & it rained a little and it blew a gale of wind from the S.W. which continued all night and rain at intervals

Friday C.S. Tooke 9 am this morn early the wind was very high from the S.W. which contined till 8. ½ past 8 My Man Gains and Shaffart both came home from up the River they brought 6 large Kangarros and 2 Emews. I put into the stores at Hunters Island 296 lbs of Kangarros, 1 they eat in the bush and 1 they sent home on Wednesday last besides 2 Emews which the Dogs killd and they could not find. My two Dogs Spot and Alexander killd them. At 7 pm blowing hard

August 1805 Remarks Hobert Town V.D.L.

Saturday C.S. Mudge 10 am the morn very windy. at 10 more moderate and fine. Mr.

Sunday C.S. Morrison 11 am the Morn very fine but the mountain coverd with snow. pm do. wr. at 4 we heard whales very near the town.

Monday C.S. The Prince 12 am I Honor of His Royal Hiness the Prince of Wales Birth the Colours were hoisted on Hunters Island. At 12 the Royal Marines fird three Vollies the day remarkably fine

Tuesday C.S. Conway 13 am the morn very fine at 2 pm His Honor the Lt. Govnr. calld upon me at my cottage which he much admired. This day at 12 I sent my Menn with my Dogs a Kangerroing at 4 pm it began to rain which continued all the Eve.

Wed. C.S. Oliver 14 am Continual rain all the day and likewise the Eve

(1) Probably oz. (in bracket).

Thursday C.S. Urania	15	am the Morn very damp and cold and Rain at intervalls
Friday C.S. Duke of York at 8 some lightning from the N. West at 10 it began to blow which continued till 12	16	am at 8 my men returnd from akangarroing from Herdsmans Cove they brought home 8 Kangarros and an Emew. 4 I put into His Majesty's Stores and an Emew. They weighd 342 lbs—1 Kan 96 1.92 4 I keept at home 2 of which I gave away to people that had none the colours were hoised this morn in Honor of the Duke of York's birth.

August 1805 Remarks Hobert Town V.D. Land

Saturday C.S. Storm	17	am at 2 it raind and blew very hard this morn the mountain was coverd with snow. I was informd this morn that the marines had the full allowance of wheat and flower 6 lbs of each and pork instead of Kangarro. At 10 rain and blowing very fresh at 2 pm the wind increasd which continued blowing hard all night.
Sunday C.S. Cambel	18	am early this morn do. wr. blowing very hard this day was the severest that we had since we have been upon the Colony the wind was a contual Gale from the N.W. It blew down many trees and unroofd Houses and took down many poles from different people
Monday C.S. Leith	19	am the Gale continued all this morn blowing from the S.W. at 4 pm it rather abated At 9 much lightning and at 10 it raind very hard which continued some time.
Tuesday C.S. Snow	20	am rain this morn at 1 pm I walkd to the farm and Xtiand Martha Hays two Daughters the Lt Govnr stood for one, at 2 it snow very hard, the road to the farm was very wet. I returnd home to dinner This morn my men went out with my Dogs.
Wed. C.S. Return	21	am this morn I walkd to the farm and Xtiand Mr. Hay's son the day very fine after the wet and Gale from the S.W. the weather is very cold.

[Here one page, containing entries for 22nd to 30th August, has been cut from the Diary]

Sept. Hobert Town Van Diemens Land

Saturday C.S. Orpheus	31	am continuel rain I walkd to the farm at 1 pm many whales Wind S.E. the Mountain coverd with snow

Sunday C.S. Maitland	1	am the weather very fine but exceedingly damp.
Monday C.S. Preston	2	am Early this morn my Man Gains returnd with my Dog which was lost. I went out ashooting and killd some Quails the day very fine.
Tuesday C.S. Supply	3	am employd all the morn upon business at 1 pm Gains and self walkd with the Dogs towards Sandy Bay and killd a very large Forest Kangarro
Wed. C.S. Minerva	4	am at 10 I went up the River near Risdon and see the Richd and Mary coming up the River from Frederic Henry bay, I landed by Prince of Whales Bay and walkd Home. At 3 pm see Capt Lucas's boats from the Richd and Mary after Whales. They killd three opposite Hobart Town this day.

September 1805 Remarks Hobert Town V.D. Land

Thursday C.S. Darby	5	am at home all the Morn the People finisd Tiling my House. busy Thatching my kitchin this aft at 3 we had some rain. the mountain with snow.
Friday C.S. Castor	6	am the day very fine at 2 pm I walkd to Sandy Bay Capt Lucas ship went down to Storm Bay Passage I killd a couple of Teal
Saturday C.S. Peterchment	7	am the day very fine 2 pm I walkd to the Farm after the Morning business
Sunday C.S. Rolle	8	am the Morn very fine At 6 pm the King George Whaler Capt. Moody came up, and anchord in the Bay
Monday C.S. Trigge Sent a Bill & Certificate to England.	9	am at 7 My Men returnd from Herdsmans Cove brought home eleven Kangarros. They kill 15 in all My Bitch Miss killd two the first time she ever went out My man killd Black Swan Mr. Groves and Son dind with me. Sent 316 lb of Kangarro in to His Majesty's Store

September Remarks Hobert Town V.D. Land 1805

Tuesday C.S. Ocean Capt. Bristo Papers to the beginning of April	10	am at 9 I walkd with my Man Gains to a River calld Mr. Brown's, down towards Storm Bay Passage distant from Hobart Town 10 or 12 miles across the country where it was very bad walking at 4 pm I returnd and Mr. Hambleton dind with me, he went on board the King George Whaler, Capt Moody. On my return I was informd that the Ocean Whaler Four months since from England was in adventure bay where she had been twenty eight days and had taken 60 tonns of oil, Not a glass of spirits in the Colony

Wednesday C.S. Enderby — 11 am at home all the day. At 11 am saild Capt. Moody of the King George Whaler for Sidney. I planted a few little Indian Corn. the day very fine.

Thursday C.S. Cornwallis — 12 am this morn saild the Richd and Mary to adventure Bay. My Men went out with my Dogs.

Friday C.S. Castlereagh — 13 am this day we had some very fine showers I walkd to the farm

Saturday C.S. Sidmouth — 14 am busy this morn at the Court

Sunday C.S. Lake — 15 am the morn very fine at 5 pm my Men returnd from Hunting and brought home a white Kangarro

Mond. C.S. Louis — 16 am at home all the morn. pm the day fine This day saild the Ocean Whaler Capt. Bristo from Adventure Bay where she had got 70 tun of Black Whale Oil in a month to Norfolk Island and from thence was to go to New Zealand for Spermacity oil.

The Ocean Whaler was only 20 days in Adventure Bay and caught 60 tun of oil. When the season ends here the Fishery begins at New Zealand.

Tuesday C.S. Essington — 17 am at 2 it blew a Gale of wind Capt Lucas ship the Richd and Mary was obliged to weigh anchor and come up the River, She brought four whales up to the Try Potts blowing hard all the Day from the South East with rain, and at 4 Hard Gale with Hail and Snow. The Evening wet.

Wed. C.S. Drury — 18 am the morn wet at 10 I went up the River in the boat opposite Risdon and landed. walkd to Mr. Millers Farm where I see 37 Black Swans in the River calld at Martha Hay's on my way home.

Thursday C.S. Palmer — 19 am at 12 Martha Hays and her mother calld at my house from the Governor. pm the aft at 4 very cold. Wind S.E. preparing my ground for Pot 8 os. I heard that the Spirits which some of the officers bought of Capt Bristo at 25sh per Gallon was very bad rum from the Leward Islands

Sept. 1805 Hobert Town Van Diemens Land

Friday C.S. Bowwater — 20 am I waited upon the Lt. Gov, and he offerd me 10 Gallons of spirits which I receivd

Sat, C.S. Darby	21	am at 11 engaged all the morn with Capt. Sladden and Mr. Harris. at 4 pm the King George whaler Capt. Moody came to the East side of the Bay from adventure Bay where he had been whaling, to land his oil with Mr. Collins.
Sunday C.S. Coronation	22	am the morn fine at 4 pm it began to Rain but was fine in the Eve, At 8 Rain which continued all night
Monday C.S. Stirling	23	am Rain all this morn 3 pm the wr. was bad this Eve my men came home from hunting and brought 9 Kangarros
Tuesday C.S. Markham	24	am the morn fine at 1 pm I went up the River in the Boat to Risdon to enquire after 2 Dogs which My men had lost. Not there came home late to dinner
Wed. C.S. Troubridge	25	am employd in planting pot 8s seed from Millers, He came and took away my little Sow and Pig. Two Bushells which gave the enormous price of £3 10s per Bushell 2 Bushells
September 1805		Hobert Town Van Diemens Land
Thursday C.S. Cochraine	26	am early this morn Thoms Steward and Morris took away one of Mr. Harris Dogs and Sarjt. Thorns and absconded from Hobert Town
Friday C.S. Murray	27	am at 9 I went across the River to see the Tryworks they had a great Quantity of Oil in casks. Mr. Collins bought a 100 ton of oil from Capt Moody of the King George Whaler which she had caught since she had been in the River
Saturday C.S. Sutton	28	am at home all the morn 5 pm Capt. Lucas dind with me
Sunday C.S. Wertenburg	29	am at 9 got all my rye chippd in by Wm Jones &c &c at 11 saild the King George Whaler belonging to Messrs. Cabel and Underwood to Sidney Steward and Morris that deserted from Hobart Town returnd.
Monday C.S. Sidney	30	am the morn wet. engaged some people to clear me 4 acres of land near the House in addition. pm at home planting Pot 8 0s &

October 1805 Hobert Town Van Diemens Land

Tuesday C.S. Manley	1	am I took a walk to the farm and killd 2 Bronswing Pigeons

Wed. C.S. Spencer — 2 At 11 I went after more pigeons but could not find any Capt Lucas supplied the Colony with a small quantity of Provisions had he not the allowence would have been 2 lbs of bread a week and 4 lbs of Kangarro at 11

Thursday C.S. Wolesly — 3 am at 11 two strange Boats were seen, coming up the River. 12 they arrived at Hobert Town the men came from Schooting Island as they had no provision left and 4 came in my boat to my great joy. 2 pm I went to the Guard House when the boats lay and the Governor came to me, he gave me joy of the return of my boat and ordered to be repaired in the best manner immediately. In the Eve Mrs and Mr Groves drank tea with the Govnr. who express his gladness of the return of my boat.
This morn I gave the Governr the skin of a very beautiful white Kangarro a very great rarity, the first that has been seen in the Colony.
In the eve I smokd my pipe at Mr. G. and stayd late

Oct. 1805 Hobert Town Van Diemen Land

Friday C.S. Dorset — 4 am the day very fine the morn I sew some Canary seed &c &c at 4 pm the Sophia came and anchord opposite my House She came from Frederic Henry Bay with oil up. ½ past 4 my men came from Herdsmans Cove with my Dogs.

October 1805 Hobert Town Van Diemens Land

Saturday C.S. Success — 5 am at 7 saild the Richard and Mary Whaler Capt. Lucas to Sidney. They gave three cheers as they went away. at 12 the Lt Govnr took in no more Kangarros in to His Maj stores having a small supply from the Rd. and Mary the quantity that I turnd in with my dogs since the 3rd August follows at one shilling per lb.

1805	3	70 — —	3. 10
August	8	296 — —	14. 16
	16	342	17. 2
	23	268	13. 8
	27 29	42	2. 2
Sept	9	316	15. 16
	16	224	11. 4
	24	350	17. 10
	24. 27	85	4. 5
Oct.	5	160	8. 0
			£107. 13

stores after being skind and well cleand weighd 105 lbs. My Dogs have killd the largest and have had only two men out with them when others of the officers have had three and four men out at a time with theirs besides a Government boat at command which I have not once had

The number of Kangarros killd by my Dogs in two months and 2 days were 66 and the quantity given away and used in the House did not amount to less than £160. This day I sent one to the

October 1805 Hobert Town Van Diemens Land

Sunday C.S. Irwin	6	am it began to Rain at 7 and continued all the day very great quantity fell at home all the day
Monday C.S. Purvis	7	am the day very wet and damp. Employd in planting various things.
Tuesday C.S. Kings Island	8	am at 8 I went to the farm with an intention to have gon to Risdon, but the weather blowing so hard we could not get up the River.
Wed. C.S. Faulkner	9	am at home all the day employd sowing seeds
Thursday C.S. Edwards	10	am at home all day writing &c for Sidney. I made a new Melon bed the wind very fresh from the S.W.
Friday C.S. Procter	11	am settled my account with Messrs, Cambel & Co.
Sat. C.S. Ferguson	12	am continual rain all the morn pm do. wr. at 10 the Night watch fird at a man at Manbys Stock Yard.

October 1805 Hobert Town Van Diemens Land

Sunday C.S. Montagu	13	am at 9 the Wr fine but damp after incessant rain, the Sophia—Collins preparing to sail. 10 the Hill clear of clouds, but Snow upon it.
Monday C.S. Bowen	14	am at 8 the Schooner Recovery which had been awhaling here sometime saild for Sidney my men went to the Coal River I took a walk with my gun and killd a Kangarro
Tuesday C.S. Bickerton	15	am at 10 I walkd out with my Gun but could not kill a Kangarro. 3 pm my Men returnd from the Coal River and my Young Bitch Miss killd 2 very large Kangarros. Gains brought home some coal from the River and very good.
Wed. C.S. Sullivan Cove	16	am at 8 the Sophia Mr. W. Collins made the Signal for sailing—11 George Collins the Lt Govnr Son calld upon me to take his leave 1 pm I see Mary Collins the Lt Govnr Daughter and wishd her Health &c. 5 pm the Lt Govnr. went on board the Sophia with his Son and Daughter and left them there

October 1805 Remarks Hobert Town Van Diemens Land

Thursday C.S. Sophia	17	am at 8 the Sophia Mr. Collins saild for Sydney at 2 pm the Breeze setting in she anchord opposite Ralphs Bay

Friday **C.S.** **Rowley**	**18**	**am at 11 I went afishing and had very good success the Sophia saild this morn from Ralphs Bay.**
Sat **C.S.** **Savage**	**19**	**am at home all the Morn till 11 then went out afishing a strong Sea Breeze.**
Sunday **C.S.** **Aplin**	**20**	**The Morn very cold Do Sea Breeze**
Monday **C.S.** **Douglas**	**21**	**am at 8 I went out with my Gun and shot a Kangarro returnd about ½ past 1 pm Nocte Do Sea Breeze**
Tuesday **C.S.** **West**	**22**	**am Early this morn my men went out a Kangarroing towards Sandy Bay but could not find any Busey after my Garden all day** The Sea-breeze generally sets in soon after 1 pm

October 1805 Hobert Town Van Diemens Land

Wednesday C.S. Berkley	23	am Early this morn Gayns and Shaffart went out in my boat across the River. at 5 pm information was given of a sail being in sight. Boats went down the River immediately at 6 the Governor Hunter Schooner anchord in the Bay and by her arrivd 582 Bushells of wheat and Pork to the very great comfort for the Colony the Prisoners having been five weeks upon 2 lbs 10 oz of Pork and 4 lbs of Bread the whole allowance of which might be eat up in one day and a Half. I may truly say the Colony was in a very dreadful distress and visible in every countenance. had it not have been for the good success in killing Kangarros the Colony would have been destitute of Everything. We had only three weeks flower in the Colony and 5 weeks Pork The Governor Hunter Schooner, was the one that Steward and the party that took my boat away went to take. A strong Sea breeze

1805 Oct. Hobert Town Van Diemens Land

Thursday C.S. Governor King	24	am This morn the Government Boats engaged in emptying the Govnr. Hunter Schooner My Men returnd from the Coal River with 2 large Kangarros Sea Breeze,
Friday C.S. British Isles	25	am at 10 the wind was very high from the S.E. and E. and very cold. pm do. Wr. at 7 rain which continued all night The Colours this Morn were hoisted on Hunters Isle in Honor of the day. Do Sea breeze

Saturday C.S. Hanover	26	am A great Quantity of Rain fell at 9 raining hard. at 12 there was the greatest fall of water in my Garden and at Sproulls [ ][1] we came to the Derwent. at 4 pm Mr. Chace and Groves dind with me. Do. sea breeze
Sunday C.S. Dacres	27	am the Morn very fine after the great fall of Rain at home all the day. this morn my Men went out after Kangarros and returnd at 5 pm with three Do sea breeze
Monday C.S. Calder	28	am at 11 Mrs. Powers and Groves came to see my cottage. 1 I gave them a Kangarro Stake &c. finishd the last of my Port Wine. Martha Hays and mother calld upon me 5 pm I had 2 young feemale Goats Do Sea Breeze.
Tuesday C.S. Duckworth	29	am at 11 the Govnr. sent a man to me from the Farm afterwards I went out afishing had very bad luck the day very cold and a strong Sea Breeze.
Wed. C.S. England	30	This morn my Man went out with my dogs at 11 information was given that a Ship was in sight the Government boat went down 2 pm it returnd a false alarm 2 pm very Strong Sea breeze the ration at this time is 6 lbs wheat a week per man 2 lbs 10 oz of Pork you may see Distress in Every ones countenance. to my knowledge that 5 small fish the Price was askd 2.6d.
Thursday C.S. Kemp	31	am at 11 I went out afishing in my Boat and caught some very fine fish. 6 pm my Men returnd and kill 4 Kang and an Emew.
November 1805		Hobert Town Van Diemens Land.
Friday C.S. Whitshed	1	am at 11 I went out in my Boat afishing the morn very cold and a strong Sea Breeze which has been regular for some days.
Saturday C.S. Collingwood	2	am the day very cold but I went out in my boat afishing pm at 9 I heard the Governor Hunter Schooner shorten cable Do breeze
Sunday C.S. Deans	3	am Early my Men went out in my Boat akang. the first time since she returnd. at 11 I walkd to the Government Farm to call upon Hays. returnd to dinner This Morn saild the Govnr Hunter Schooner for Pt Jackson. A strong Sea Breeze.
Monday C.S. Pakenham	4	am at 9 we had a strong land Breeze and a warm wind which continued all the day. Employd in my Garden about Pumkin Bed.

(1) [ ] illegible.

Tuesday C.S. Knowles	5	am at 11 Mr. Harris and self sat upon the bench 1 pm I went to meet my Man towards the Govt Farm at 3 I met him and returning home in my boat I observd a ship coming up the River. ½ past 4 she anchord opposite my House. H.M. Ship Buffilo Capt. Houston at 5 he went on shore. the first ship of His Majesty's Navy that came to Hobart Town She came from Sydney and brought us a little Provision. Mr. Humphry came in the ship.

November 1805 Hobert Town Van Diemens Land

Wednesday C.S. Houston	6	am at 11 I went in my Boat up the River afishing had very bad success. Capt. Houston and a party went to the Govmt Farm and to Risdon. Sir E. Brown Hays and a party of settlers from Norfolk Island came to see my land &c., which they all liked very much and said it was the only place worth seeing.
Thursday C.S. Wilson	7	am at 8 I went on board H.M.S. Buffalo Capt. Houston to Breakfast we came on shore together and at 10 went on the Parade when the Lt. Govnr had everything explained to his satisfaction respecting the assertions of Mr. Collins
Friday C.S. MacMillan	8	am at 8 Capt. Houston calld upon me and we went on Board to breakfast
Saturday C.S. Gower	9	am breakfasted on board.
Sunday C.S. MacKenzie	10	At 8 Capt. Houston and Mr. MacMillan the Surgeon breakfasted with me at 10 went on Board Lt. Johnson came we stayd and took Tiffin there at 1 pm Mr. MacMillan and Mr. Sherrard and self walkd to the Farm
Monday C.S. Vauxhall	11	am at 8 H.M. Ship Buffalo made the signal for sailing 9 the wind came contrary and she compleating her watering Capt. Houston and Mr. MacMillan calld upon me at home all day.
Tuesday C.S. Tippo Hee	12	am this day H.M. ship Buffalo Capt. Houston compleated her watering at 5 pm Capt. Houston dind with me.
Wed. C.S. Buffalo	13	am at 8 I went on board H.M. Ship Buffalo and Breakfasted with Capt. Houston Lt. Johnson Mr. Bowden, Mr. Humphry breakfasted then we made it up At 9 H.M. Ship Buffalo got under weigh 12 being down the river as far as Storm Bay Passage Lt. Johnson and Mr. Bowden and self came back to Hobart Town.

November 1805 Hobert Town Van Diemens Land

Thursday C.S. Putney	14	am at 12 Lt. Johnson and Mr. Janson calld upon me and took tiffin
Friday C.S. Thames	15	am at 11 Mr. Fosbrook and Bowden calld upon me 6 pm His Honor the Lt. Governor calld at 8 it began to lightning at 10 it was a severe tempest which continued all night with rain at intervals.
Saturday C.S. Cobham	16	am this morn the Majestrates sat and G. P. Harris Esq. calld on me the wind blowing very hard from the S.W. and cold
Sunday C.S. Guilford	17	am at 9 do. wr. at home all the day at 10 pm we had a Heavy rain
Monday C.S. Monsel	18	am at 11 I went up the River beyond the Govmt. Farm in my boat and walkd Home
Tuesday C.S. Liphol	19	am the day very windy from the S.E. continual rain all day

November 1805 Hobert Town Van Diemens Land

Wed. C.S. Sladden	20	am at 12 calld on Mr. Fosbrook the wind blowing hard.
Thursday C.S. Harris	21	am at home all day Employd at my Garden. My men returd from Herdsmans Cove.
Friday C.S. Horndean	22	am 12 calld on Mr. Harris afterwards on Capt. Sladden and met Lt Johnson Mr. Fosbrook and Bowden there we walkd into the Govmt. Garden. afterwards went out afishing.
Saturday C.S. Cosham	23	am this morn I calld upon Mr. Janson and afterwards walkd to the Farm
Sunday C.S. Portsmouth	24	am at 9 Lieut Johnson Breakfasted with me at home all day
Monday C.S. New Cross	25	am at 10 I went out afishing Capt. Sladden and Mr. Bowden calld on me
Tuesday Blackheath	26	am at 9 I sent my man up to the Cove 11 self and Capt. Sladden sat on the Bench.

Hobert Town Van Diemens Land

Wed. C.S. Welling	27	am at 9 Capt. Sladden and Mr. Bowden Breakfasted with me at 1 pm Mr. Bowden and self walkd to the Farm
Thursday C.S. Dartford	28	am 11 I walkd up the River. 12 a Signal was made that a ship was in sight. 4 pm she anchord in the Bay, the ship Sidney Capt. Forester from Norfolk Island, and by her returnd Lt. Lord
Friday C.S. Forrest	29	am at 10 I see Lt. Lord who was coming to my House At 6 pm Mr. & Mrs. Groves drank tea with me
Saturday C.S. Patterson	30	am at 11 I was introduced to Capt. Forrest at 2 pm I went on board for a little time my men returnd from Herdsmans Cove

December Hobert Town Van Diemens Land 1805

Sunday C.S. North Fleet	1	am at home all the day
Monday C.S. Gads Hill	2	am at 1 the wind blowd very hard 2 we had a very severe Gale which continued some time The Sydney drove both her anchors. In the Eve the Governor called upon me
Tuesday C.S. Rochester	3	am at 9 Mr. Fosbrook gave a Breakfast to all the officers and Capt. Forrest.
Wed. C.S. Rainham	4	am at home all the morn Mr. Janson Bowden and Harris calld upon me at 1 pm the ship Sydney went across the River to the Try Works to take in oil
Thursday C.S. Boxchild	5	am at home all the morn till 2 pm called upon Capt Sladden
Friday C.S. Preston	6	am at 11 I took my boat and went on Board the Sydney Capt. Forrest
Saturday C.S. Canterbury	7	am at 9 went on board Capt. Forrs ship and dind with him blowing very hard all the day
Sunday C.S. Ewell	8	am at home all day divine Service could not be performd
Monday C.S. Dover	9	am 11 Capt. Forrest came on shore and calld upon me this morn I calld upon His Honor the Lt Govnr. the day very warm and land wind N.

Tuesday C.S. Knights Bridge	10	am at 11 I went on board for a little while
Wednesday C.S. Depart	11	am 2 pm I went on board the Sydney to dinner came home at 5.
Thursday C.S. Hammersmith	12	am 11 the Sydney came near Hobart Town and anchord
Friday C.S. Brentford	13	am at 11 His Honor went on board the Sydney at 1 pm I went there. Lt. Johnson and a party of Marines went on board with Smith a Marine to be tryd at Sydney

1805 Hobert Town Van Diemens Land

Saturday C.S. Spring Grove	14	am at home all day
Sunday C.S. Johnson	15	am ½ past 4 saild the Sydney to Frederic Henry bay to take in oile at 11 performd Divine Service in the tile house attended by His Honor &c &c.
Monday C.S. Bedford	16	am engaged at home all day
Tuesday C.S. Egham	17	am engaged in writing letters for England at 11 pm His Honor the Lt. Gov sent for me. I went to him and stayd till 2 am upon business.
Wednesday C.S. Hartford Bridge	18	am Lt. Johnson who went down in the Sydney came on shore and informd us that Capt. Forrest was to sail on Saturday morn and that he was to be on board on Friday morn early
Thursday C.S. Whitechurch	19	am employd in my Garden sowed Turnips

December

Friday C.S. Salisbury	20	am we sent letters on board the Sydney for England.

Honble. Capt. Gardner Mrs. Pettit. Mr. Collins

Saturday C.S. Dorchester	21	am early this morn Lt. Johnson went on board Deserted from Hobart Town Carmical—Morris Scotsfort from the GuardHouse and Gibson, Mr. Hopley servt.

Sunday C.S. Bridport	22	am at 11 performd Divine Service. St. MaCauley came from the ship, Mr. Powers brought a quantity of Spirits with him Lt. Lord drank tea with me and his friend
Monday C.S. Axminister	23	am at home all the day a very strong sea breeze with heavy rain from the S. East.
Tuesday C.S. Honiton	24	am very cold for the season and a quantity of rain from the S.E. with hail
Wed. C.S. Exeter	25	am Xms Day morn at 8 the Colours were hoisted on Hunters Island at 11 all the Civil and Military attended Divine Service.

December 1805

Thursday C.S. Lancaster	26	am at 3 I got up and Breakfasted 4 I got into my boat with my Men and went into Ralphs Bay and walkd to Frederic Henry where I had a Boat from the Sydney Capt. Forrest but it blowd so hard that I did not get on board till 9 pm had nothing to eat and drink since I left home. dind there Lt Johnson was on board. Mr. Bowden and Mr. Fosbrook came on shore with Boat.
Friday C.S. Forrest	27	am staid on board all the morn 3 pm Capt. Forrest Lt. Johnson and self went on the South side of the Bay we see to me of the largest Ducks I ever beheld we return on board for the Eve.
Saturday C.S. Bodmin	28	am at 5 I got into the Sydney's boat and came on shore got to Ralphs Bay and with a strong Breeze came to Hobart Town at 2 pm waited upon the Lt. Govr. who was very glad to see me shew me a letter from Mr. F. respecting Mr. Powers. I calld on Lt. Lord.

December 1805

Sunday C.S. Penryn	29	am at 10 I walkd with His Honor the Lt. Govnr to Newtown where I performd divine Service at 4 pm I dind with him.
Monday C.S. Lands End	30	At home all the day
Tuesday C.S. Kings Land	31	am at 11 His Honor walkd to see Lt. Johnson Farm and Millers the settlers—engaged all the morn upon business

Hobert Town January 1806

Wed. C.S. New Year	1	am at 8 the Colours were hoisted on Hunters Island it being New Year's Day. this morn Rogers Mr. Hopleys servt went into the Bush and took dogs with him and a gun at 5 pm all the officers Civil and Military dind with Lieut Lord not being very well I came away early Sent my Man with the Govnrs Keeper and 2 of the Boats Crew up the River in my boat with my Dogs.
Thursday C.S. Collens	2	am at ½ past 4 I waited upon His Honor the Lt. Govnr. at ¾ past we with Mr. Bowden the 1st assistant Surgeon and Mr. Harris the Surveyor walkd to the Governmt Farm where we Breakfasted at 7. we got in to the Govnr 6 oar Boat and went up the River to the first Fall where we arrived at half past 5. a distance about 40 miles from Hobart Town there we had two Huts built at ½ past 6 we sat down to a very excellent dinner, everything provided by the Governr but the Kangarro My man met us with a very fine one killd in the Morn, the same eve my man went out and killd a very fine Kangarro which I supplied all the Servants and men with. The Govnr and self slept in one Hut and Mr. Harris and Mr. Bowden in another.
Friday C.S. Success	3	am at 5 we Breakfasted and we all set off up the River on foot about 15 miles observing the Course of the River and the Hills and Plains, which were very extensive the River at the distance we went was very broad and a strong current we went to the first Cataract there we refreshd and returnd at 6 pm to dinner the men that were left behind caught some very fine Eels which we had for dinner and a very pleasant Eve we had.
Saturday C.S. Return	4	am at 5 we Breakfasted and at ½ before seven we got into the Boats and went to Herdsmans Cove the Govnr and we walkd to see the plains which were very extensive at 2 pm we dind and got into the boat and came to Hobert Town where we arrived at at 8 after an one of the pleasantest excursion that I ever took, I never see the Govnr so comfortable and paid every attention to us that was possible.

V.D.L. Hobert Town January 1806

Sunday C.S. Cataract	5	am divine service was not performd at 1 pm I waited upon His Honor the Lt. Govnr—at home all the aft
Monday C.S. Edmonton	6	am at 11 I went out afishing 1 pm Mr. Bowden calld upon me Bowers a man that was absent in the Bush was taken and brought in.
Tuesday C.S. Waltham	7	am at home all the morn 2 pm G. P. Harris Esq calld upon me

Wednesd C.S. Wormley	8	am at 12 I went out afishing and Lt Johnson servants returnd from Browns River, and brought in a native Girl with them
Thursday C.S. Harvest	9	am at 4 I went in my boat down the River and caught some crayfish returnd at 6 pm This day the Harvest began at the Government Farm
Friday C.S. Ware	10	am Early this morn the little Native Girl which was brought into Hobert Town made her escape out of a window at Wiggin's a marines with whom she livd

V.D.L. Hobert Town January 1806

Saturday C.S. Arrington	11	am this morn I began to have my Wheat cut. at 1 pm I walk to the Govmt farm. a very fine crop they have got.
Sunday C.S. Huntingdon	12	am at ½ past 6 the Royal Marine Barracks caught fire and one end was consumed. at 11 performd divine service the Military did not attend. the Country on fire on the N.E. side of the River and likewise on the N.W. by Millers and the Government Farm by the Natives
Monday C.S. Norman Cross	13	am Sent my Men to the Pitt Water aKangarroing at 3 pm the Country on fire by the Natives with makes it very hot. at Hobert Town all the Settlers very busy in Harvest
Tuesday C.S. Sanford	14	am at home all day the wind blowing very hard from the S.W. pm do. w. with some rain

Jan.

Wednesday C.S. Newark	15	am the wind continued all this day with thunder and lightning at 3 pm Rain every body busy in Harvest
Thursday C.S. Carlton	16	am at 10 Lieut Lord and his friend and self went in my boat up to Risdon where we dind, at the Cottage in the Garden olim Mr. Browns. At 6 pm we got into the Boat and came to Hobert Town
Friday C.S. Markham	17	am at home all the morn 5 pm a strange Boat arrived from a schooner belonging to Cable and Underwood of Sidney the Mercia
Saturday C.S. The Queen	18	am at 9 the Colour were hoisted at Hunters Island in Honor of the day. This morn anchord the Mercia schooner from Pt Dalrymple at 12 the Royal Marines fird 3 vollies and a Royal Salute of 21 Guns were fird by the artillery. the day very cold and wet

Sunday C.S. Sophia	19	am at 8 anchord in the Bay the ship Sophia Mr. Wm Collens from Sydney the day very cold and wet by the Sydney we received 1110 Bushells of Maise from Sydney

January 1806

Monday C.S. Mercia	20	am at 8 snow upon the Mountain this morn I receivd 30 Gallons of Brandy. the day cold and wet, busey in harvest
Tuesday C.S. Reward	21	am This morn saild the Mercia schooner and by her I sent letters to Capt. Houston &c &c. The General Order Jan 21 1806 His Excellency the Governor in Chief has been pleasd, at the recommendation of the Lieut Govnr to grant a Conditional Emancipation, bearing date the 18 day of Dec. 1805 to each of the five following persons Viz.

John Ronaldson
Urias Allender
Christopher Forsha
David Wakefield
Wm Thomas

In consideration of their good conduct, and for volunteering their services by going in a six oared Cutter from Port Phillip to Port Jackson to announce the arrival of H.M. Ship Calcutta from England with an Establishment to form a Settlement at that place under the direction of the Lt. Govnr. N.B. Mr. Wm Collens had the command of the Cutter and when he was out some distance from Pt Phillip he coasted it and ran into every place for shelter he could, when the Boat was out and met with a strong breeze he turnd too and got very drunk leaving the Boat to the care of the Prisoners and about 80 or 100 Mile from Pt Jackson he got on board the Ocean Transport which saild from Pt Phillip for that place

January 1806

Wed. C.S. Doncaster	22	am at 11 the Magestrates met to try the several prisoners that absconded from the Colony

Escaped
Wm. Roberts } 28 Oct. 1805 Ret. 3 Jan. 1806
Joseph Woolley } do. — — Red. 20 Jan. 1806
Thomas Story 24 Nov. 1805 Ret. 3 Jan. 1806
—Nelson—20 Dec. taken 9 Jan 1806
D. Gibson }
Adam Carmichal } 21 Dec. Ret. 20 Jan 1806
Coatsworth }
Morris }
Wm. Bowers—22 Dec. taken 9 Jan. 1806
John Rogers } 30 Dec Ret. 15 Jan. 1806
J. Campbell } . . . Ret. 20 Jan 1806

Each of the Men were sentenced to Receive 300 each and to be worked in Irons for 1 year.

[Here one page, containing entries from 23rd to 31st January, has been cut from the Diary]

February 1806

Saturday C.S. Newton	1	am at 6 the Sophia went out of the Bay and anchord in the middle of the River
Sunday C.S. Sophia	2	am at 11 performd Divine Service His Honor did not attend the day very hot 8 pm much lightning and at 9 a severe tempest which continued till 11
Monday C.S. Beeford	3	am at 11 I went out afishing had very bad success. Busey in getting the house down which I bought of Mr. G. P. Harris the country on fire on the E. side of the Bay
Tuesday C.S. Berwick *Forshaw* a conditional Emancipated Man	4	am engagd this morn upon Business between Mr. Hopley and Kelly his Honor the Lt. Govnr came to the Court when Capt. Sladden and self were there at his request I won *Forshaw* an evidence to what he had Deliverd to the Court. The Lt. Govnr said that when he was Judge advocate he always did sware them the whole of the proceedings were read to him while he was in the Court.

this morn all the Military refused taking the provisions according to the order of the Lt. Gov. the order was for each man 6 lbs Maze 5 lbs Meat[1] 2 lbs Pork. 6 ozs Sugar

February 1806

Wed. C.S. Linton	5	am at 12 Mr. Harris calld upon me. at home all the day busey in harvest, the day very hot much in want of rain this morn the military had their provisions, but the order was changed, the ration for them is 4 lbs Flower 6 lbs wheat 4 lbs Pork 12 oz Sugar
Thursday C.S. Leith	6	am at home all the day
Friday C.S. Edingborough	7	am this morn finis'd carrying my Wheat and began to threshing my seed wheat
Saturday C.S. Kincross	8	am the morn very hot at 2 pm it began to thunder from the West ½ past 3 heavy Thunder with moderate rain this morn I bought 1 lb of Tobacco and gave 1£ sterling for it I got all my Wheat up and gave the men a good dinner and Spirits at 7 it began to lightning ½ past 8 it increasd very much At 9 I went out and the lightning was the most severe we ever had it on the colony and the Thunder the most awful all my men very D— . . at the rain continued from 9 to 12.

(1) ? 'Meal'.

February 1806

Sunday C.S. Rosefield Steward Cowlan Harris Wisdon Fennander Carrot Brown	9	am at 2 the Tempest continued at a distance it went to the N at 8 the air very cool and the ground much refreshed after the great drought. At 11 performd Divine service This morn the following men went away with a Government Black cutter Flinders olim and they took Blinkworth the settlers part of the way to Sandy beech to take their things down in it.
Monday C.S. Forfar	10	am early this morn more rain at home all the day sent my men out with my Dogs aKangarooing
Tuesday C.S. Aberdeen	11	am at home all the day at 7 pm My men returnd and brought home Spott dead he had ran a Kangarro and killd it. When the man came to the place where they see him last he laid dead
Wed. C.S. Trent	12	am this morn had my famous Dog Spott opend and found that he had receivd an inward blow from which his death was occasiond.
Thursday C.S. Tees	13	am at 6 I went down the River in my boat afishing and stayd till 6 pm had very bad success

February 1806

Friday C.S. Valentine	14	am at home all the day
Saturday C.S. Tyne	15	am this morn engaged upon Business at 2 pm went out afishing no success
Sunday C.S. Blyth	16	am at 11 performd Divine Service. at 1 pm a very strong N.W. wind and exceedingly hot 3 pm do. wr. the aft and Eve was very hot and a large fire near Hobert Town toward the Farm
Monday C.S. Tweed	17	am at 12 I calld upon Lt. Govnr Collins when he informd me that he was going to send a letter to the officers at 4 pm Mr. Fosbrook and Mr. Bowden calld upon me this day a Whale Boat belonging to Messrs. Cambel & Co was upset in the River and 2 men lost in it. I had permission to go down the River.

Tuesday C.S. Markham 18 am at 6 I got into my boat with 4 Men Earl and Gains, my men Clark and Williams. McCauley servant and a Government man went down the River with a fine breeze at 9 we got to Storm bay passage ½ past 12 at Green Island the wind blowing very fresh at 3 we were in the River Houin. at 4 opposite Gardners Island ½ past we landed made a fire and dressd some dinner

Feb. 1806

sent my man out with my Dogs after Kangarros but no success went out fishing and caught some. We slep on the Sandy beech a very fine night,

Wednesday C.S. Dee 19 am early this morn sent my man out with our Dogs no success some went out afishing caught some very fine Fish which we dressd for Breakfast at ½ past 8 we made a start for the Point where the Sassifrass tree was we got there at ½ past 12 a very strong Breeze at 3 see a Black swan made sail after it and caught it. Dressd one for dinner which we caught as we were going up the River at 5 blowing hard.

Thursday C.S. Abberley 20 am we Breakfasted at 4—At 6 got into the Boat at that time some Swanns came opposite the Point made sail after them and caught 4. at 7 we bore up to the Western side of the River 12 got to Houin Island and went on shore ½ past the wind came so strong that it was impossible to get forward was obliged to go back to the Bay by Gardners Island at 4 made a fire dressd a swan and fish. slept there a very cold night at the farther end of the Bay we found a run of water and some distance got the boat up filld our casks of very fine water.

Friday C.S. Raynshay 21 At 3 am we got into the boat and rowd to Green Island where we landed at 7, ½ past got into the Boat and went part of the way through Storm bay Passage made fire and Breakfasted at 12 we got into the boat again and got into the large Bay on the S.W. side of the passage sent the man out aKangarroing My Bitch Miss came to me and we see she had killd a Kangarro she took me to it though it was near dark Slep there all night

Saturday C.S. Wykeham 22 At 4 made sail through the passage, when we got near the Western Bay we see two Catermarans with Natives in them they put back as soon as they see us their Catermarans were made of Bark at 9 we got in the Derwent went to Brown River where we caught some fish dressd it for Breakfast at 1 made sail for Hobert Town when we landed at 4 pm 7 I calld upon the Lt. Governor—

Sunday C.S. Wotton 23 am at 11 performd divine Service At 4 pm dind with His Honor the Lt. Govnr.

Feb. 1806

Monday C.S. Woolly	24	am at home all the day exceedingly hot Lt. Lord Mr. Bowden Mr. Fosbrook dind with me at 4 pm at 8 the Thermometer stood at 75.
Tuesday C.S. Woodbridge	25	am this morn engaged upon business at ½ past 12 the Lt. Govnr askd self and Capt. Sladden to take some wine the Lt. Govnr said he would lend me 4,000 bricks and to pay him when Croft made me some
Wed. C.S. Woodsend	26	am at home all the morn 1 pm I went with my men to the Government farm they went aKangarroing
Thursday C.S. Woodberry	27	am at 11 My Men returnd and the Bitch Miss kild 4 large Kangarros and they brought home 1 duck very great sucess in Killing the Kangarros the ground being so hard without rain
Friday C.S. Witton	28	am at 9 I went down the River afishing ½ past 1 pm made sail to come home but the wind blowing in strong Gusts we were obliged to return and anchor. 3 made sail and got home 6 pm

March 1806

Saturday C.S. Wales	1	am at 8 the Colours were hoisted on Hunters Island in honor of St. David's Day the day very hot from the N wind blowing all day very hard At 10 pm a little Rain
Sunday C.S. Wintersloe	2	am the morn very wet divine Service could not be performd at home all the day omne Nocte a sharp frost this Eve Cole the Marine discoved in a Robbery at H.M. Stores
Monday C.S. Wingfield	3	am at 11 went out afishing in my boat caught very few
Tuesday C.S. Windsor Castle	4	am at home all the day 5 pm I took my boat and went afishing. This Eve I bought a Pumpion for which I gave 9 shillings
Wed. C.S. Wyndham	5	am at 1 pm a small quantity of rain fell at 4 pm went out afishing
Thursday C.S. Winchester	6	am the day very fine At 12 calld upon His Honor the Lt Governor. 7 pm the boats crew drew the net opposite my House and caught very fine Mackerell some were sent me the this eve.

Friday C.S. Governr Collins	7	am at 9 His Honor went down the River with Mr P. to Ralphs bay at 6 pm they returnd.

March 1806

Saturday C.S. Winchelsea	8	am at 12 I walkd to the farm and returnd home to dinner
Sunday C.S. Wimbledon	9	am at 9 rain, 11 Do. wr. that Divine Service could not be performd. Everything is burnt up for want of the Rain at 12 My Man returnd from up the River and brought home 7 Kangarros 2 Ells and a Duck and Pigeon. pm 2 a very fine shower of Rain and very greatly wanted
Monday C.S. Wilmot	10	am at 11 I went down the River to get some Rafters &c for a House and caught some very fine Mullet. Returnd at 5 pm
Tuesday C.S. Willoughby	11	am at 11 I waited upon His Honor the Lt. Govnr and in the Eve went afishing
Wed. C.S. Willis	12	am at 11 I got into my boat with my Dogs and men and went up the River under Mount Dromedary where we dind, at 5 went out with my Dogs and Killd a Kangarro but could not find it Slept at the Bottom of the Hill
Thursday C.S. Willett	13	am Early this morn Gains went out with my Dogs and Killd 2 Kangarroos we Breakfasted and went up the River much higher. got there at 3 pm dind and went out with my Dogs. Killd a Kangarro slept there

March 1806

Friday C.S. Wilkins	14	am at 5 we got into my boat and came down the River. Breakfasted at the Bottom of Mount Direction at 12 made sail under Bedlam Walls where I anchord the Boat and caught some very fine Fish. At 5 got to Hobert Town
Saturday C.S. Wickham	15	am this morn Engaged upon business till very late. at home the remainder of the day
Sunday C.S. Whitworth	16	am at 11 performd Divine Service At 4 pm I dind with His Honor the Lt. Govnr
Monday C.S. St. Patrick	17	am at 10 the weather very cloudy went out afishing caught very few. at 7 pm the Boats Crew drew their seine opposite my House and enclosed so many Mackerell that with difficulty they could draw the net on shore.

Tuesday C.S. Supply — 18 am at 10 it began to rain which was very greatly wanted 11 My men went up the River with my Dogs. 12 very fine Rain All the Prisoners supplied with Mackerell the wet continued all the Eve at 9 pm one remarkable loud clap of Thunder and the Lightning before it was the longest I ever see

[Here one page, containing entries for 19th to 30th March, has been cut from the Diary]

Monday C.S. Wescott — 31 am at home all the day A great quantity of Rain

Tuesday C.S. Wentworth — 1 April 1806
Upon Business all the morn do. wr.

Wednesday C.S. Wellwood — 2 am early this morn my men went out with my boat and unfortunately they ran the Boat on the Rocks I took a govnt boat and went to their assistance

Thursday C.S. Willby — 3 am the wind blowing hard from the South and rain at intervals

Friday C.S. Wedgewood — 4 am Good Friday at 11 performd Divine Service. 1 pm my men made a Signal took the New Boat which the Govnr had made for Green & Trim his Govmt Game Keepers at 8 am a Native Girl about 17 was in my Garden the first that I ever see near me She ran away some small distance and then stopd. I went to her, she wanted some fire which got for her and some Fish and Bread, but returning to get some more fire she ran off. I see no more of her At 6 pm the Lt. Govnr calld upon me

Hobert Town April 1806

Saturday C.S. Webber — 5 am at 11 I took Mr. Clarks boat and went out afishing very little success

Sunday C.S. Longford — 6 am at 11 Performd Divine Service 4 pm I dind with His Honor the Lt. Govnr—in the Eve rain

Monday C.S. Langley — 7 am the morn wet I went out in my boat but she was so bad that I was obliged to come home

Tuesday C.S. Lough — 8 am at home all the morn upon business

Wed. C.S. Twyford	9	am Early this morn I went down to Brown River and returnd late in the Eve
Thursday C.S. Reading	10	am this morn I went down to Brown River for my Man that I left Kangarroing
Friday C.S. Cork	11	am this Day a Whale was seen in the River near Ralphs Bay
Saturday C.S. Johnson arrivd at Hobert Town	12	At 11 I went down the River and met Mr. Oxley coming up in his boat I took him in my boat and came up with him to Hobert Town I carried him a Kangarro &c &c. at 5 pm the Estremina schooner anchord in the Bay. the Military that went to Sydney in the Sydney
Sunday C.S. Oxley	13	am at 9 James Keting a Cooper from Port Dalrymple landed under the care of James McCauley who acted for the time as Provost Marshall. This unfortunate man had been tryd at Sydney and found guilty of death and one [ ][(1)] a Soldier in the New South Wales Corps these men suffer death for robbing His Majestys Stores. I attended James Keting all this day till near 11 pm
Monday C.S. Example	14	am at day light I went to see the said James Keting and continued with him till 8. ½ past I went to him again and administered the sacrement, Continued with him. We went together to the place of execution. He prayd fervently and was truly prepared to meet his unhappy fate. At 10 he was numbered with the dead. He was attended at the awful Tree by His Honor the Lt Governor and all the military officers and some of the civil. the military and all the convicts attended the melancholy sene At 4 pm Capt. Sladden Lieut Johnson and Lieut Lord and Lieut Oxley R.N. and self dind with His Honor the Lt. Governor.

April 1806 Hobart Town

Tuesday C.S. Hungerford	15	At home all the day. The day wet and blowing fresh from the S.E.
Wed. C.S. Overton	16	am at home till 1 pm. I took my boat and went out afishing, very bad success. At 4 it began to blow and rain which continued some time with thunder and lightning Lieut Johnson and Oxley calld upon me
Thursday C.S. Marthfield	17	am at 9 Capt, Sladden Lieut Johnson and Lord with Lieut Oxley breakfasted with me. At 4 pm I dind at Mr. Fosbrooks and met all the civil officers with Lt. Johnson and Lt. Oxley came home early

(1) Name omitted.

Friday C.S. North	18	am the morn very fine at home all day
Saturday C.S. Depart	19	am upon Business this morn. At 4 I dind with Lt. Lord and met Lt. Oxley and Johnson with Mr. Bowden

April 1806

Sunday C.S. Monckton	20	am performd divine service. At 5 I dind with Capt. Sladden met Lt. Oxley & Johnson there the Lt. Govnr promised me to set up my oven
Monday C.S. Oxley Sent letter to England per Estremine.	21	am at 7 saild the Estremine, Lt. Oxley at 5 pm I dind with Lt. Johnson met Capt, Sladden Lt. Lord, Mr; Fosbrook and Mr. Bowden in the eve a great quantity of rain
Tuesday C.S. Supply	22	am this day kangarro was taken into H.M. Stores my men went out in the eve rain, opposite my house at 7 pm they took a great quantity of fish, more than has been caught this season
Wednesday C.S. Latham	23	am a quantity of rain fell this morn, 2 pm do. wr.
Thursday C.S. Dudley	24	am Rain and the day very hot at home all the day
Friday C.S. Calcutta	25	am do. wr. at home all the morn 1 pm I walkd to the farm home to dinner
Sat. C.S. Ocean	26	am this morn my Men came home from Kangarroing very poor luck I put 2 into the Stores and keept 1 Emew and a Kangarro.

April 1806

Sunday C.S. Walsall	27	am Divine Service could not be performd
Monday C.S. Tamworth	28	am the day very cold
Tuesday C.S. Ashborn	29	am at 7 very cold and a little snow the mountain had much upon it 9 blowing very fresh from the S. West ½ past 2 pm the mountain was coverd with snow at 8 the night very cold

Wed. C.S. Burton	30	am Early this morn blowing hard from the N.W. at 8 the Mountain coverd with snow the day very cold and strong N.W. wind
		May 1806 Hobert Town
May Day C.S. Derby	1	am the morn very cold with slight snow at 9 blowing very fresh from the N.West. in the Eve blowing very hard with much snow.
Friday C.S. Nottingham	2	am at 11 my men came down the river and brought 9 Kangarros and an Emew the Emew I gave to His Honor the Lt. Governor—blowing very fresh this morn from the N.W. at 3 pm more moderate at 8 rain with much snow
Saturday C.S. Westwood	3	am the day very cold and blowing hard from the S.W. at intervals I bought a Pigg of Mr. Lord for 1.10
Sunday C.S. Mansfield	4	am the morn very wet Divine Service could not be performd this morn I spoke to the Lt. Govnr again about Sharrard the Govmt Mason that was sent down to work at Mr. Collins
Monday C.S. Uxbridge	5	am the day Blowing very hard and snow at intervals my Men went up the River I bought a Pigg of Willis £3.
Tuesday C.S. Wycombe	6	am this morn Sharrard the Govmt Bricklayer came to work at my Oven my having been promisd him more than a fortnight back by the Lt. Govnr himself, but he was sent down to work at Mr. Collins for 2 days only and was Keept by Mr. C. there at work for a fortnight but 2 days vide Sunday 4
May		Hobert Town V.D. Land 1806
Wednesday C.S. Newton	7	am this morn very fine after the Gale which we have had for some days
Thursday C.S. May	8	am the day very fine I walkd to the Govmt Farm and came home to dinner
Friday C.S. Oxford	9	am Early this morn my Man Gains came home from Kangarroing At 1 pm I went up in my boat with him to the Farm Point landed and walkd home to dinner 151 lbs Kangarro
Saturday C.S. Abbingdon	10	am the day very fine at 4 pm Raind this aft. Hunter and Roberts made their escape from the Watch house at 8 Lightning from the West

Sunday C.S. Taringdon — 11 am the morn very rainy at 11 Do. Wr. Divine Service could not be performd at 4 pm I dind with Lt. Lord met Mr. Bowden at 8 much Lightning

Monday C.S. Burford — 12 am this morn engaged upon business my men came down from Kangoròoing and returd some into the Stores The day very cold

May — Hobert Town V.D. Land 1806

Tuesday C.S. Letters &c. Spender & McTustin — 13 am the morn wet At 7 pm we heard a Gun fird at 8 anchord in the Bay the King George Whaler Capt Moody the Lt. Govnr sent a boat on board and by the ship arrived the Deputy Judge Advocate Mr. Bate He came on shore waited on the Lt. Govnr and went on board the same Eve I received letters from the judge advocate. came in the Wm. Pitt from England to Sydney. 11 monts on her passage

Wednesday C.S. Bate Mrs. P. — 14 am at 12 Capt. Sladden and the Judge Advocate calld upon me at 1 pm I waited upon the Lt. Govnr we were informd of Ld Nelsons Victory and the Cape being taken I received Letters and a Box

Thursday C.S. Arrival — 15 am this morn at 11 the Lt. Govnr sent for me and we took some Port Wine

Friday C.S. William Pitt — 16 am at 8 I see three Boats from the King George whaler off after whale in the River

Saturday C.S. Wales — 17 am the day very fine at 11 I took a walk to Sandy Bay and Killd some Wattle Birds at 4 pm Mr. Hambleton of the King George whaler dind with me.

May 1806

Sunday C.S. Blith — 18 am at 11 performd Divine Service attended by the Lt. Govnr &c &c. the D.J. Advocate at Church being the 1 Sun after his arrival at 4 pm I dind with the Lt. Govnr saild the King George Whaler to Frederic Henry Bay awhaling

Monday C.S. Supplies — 19 am the morn I calld upon Capt and Mrs. Sladden the Judge Advocate at the Captains House at 2 pm rain

Tuesday Parole North Creak C.S. " Stowe " — 20 am the day very fine at 12 I calld on Capt Johnson 6 pm He calld on me and supd with me I shot some Wattle Birds and sent them to the Lt Govnr

Wed. C.S. Stroud	21	am at 11 I went out with my Gun and took Ch Williams a prisoner about 3 miles from the Town and I shot a Kangaroo 5 pm Capt Johnson and his friend dind with me a very sharp frost this morn
Thursday C.S. Tewkesbury	22	am the day very fine at 4 pm I dind with His Honor the Lt. Govnr and met Capts Sladden and Johnson and the Deputy Judge Andvocate
Friday C.S. Severn	23	Dr. Wr. at 5 I dind with Capt Johnson at home all the Day
		May 1806
Saturday C.S. Trent	24	am at home all the day. the wr. remarkably fine
Sunday C.S. Birdwood	25	am Whitsunday at 11 performd Divine Service all the Feamale Prisoners attended, a very fine(1) congregation
Monday C.S. Weston	26	am at 11 I went out afishing caught some very good Rock Codd—5 pm the Judge Advocate James Bates Esqr Captains Sladden and Johnson dind with me
Tuesday C.S. Ledbury	27	am at 5 rain 11 clear at home all the day No
Wed— C.S.	28	am the morn I went to the Govmt Farm upon business at 5 pm Lt. Lord Dind with me
Thursday C.S. Restoration	29	am a sharp frost this morn at 12 the Judge Advocate calld upon me
Friday C.S. Monmouth	30	am The Magestrates met by order of a General Order Examine into the State of the Colony and to adobt the best manner for the safety of the Colony and to regulate the high Price of Provisions and examine the Bakers &c &c
		June 1806
Saturday C.S. Bricknock	31	am the day very fine at 12 I went out afishing for a little while. In the Eve much Lightning

(1) 'fine' may be 'ful'.

Sunday 1 June C.S. Cardiff		am the morn very cold at 11 performd divine service At 1 pm Mr. Wm. Bowden calld upon me. The Lt Govnr unwell. I calld upon the Govnr
Monday C.S. Rejoice	2	am at 11 I walkd to the farm with Mr. Bowden and returnd at 4 pm I calld upon the Lt. Govnr, and he was better
Tuesday C.S. Milfordhaven	3	am the day very fine at 5 pm I dind with Mr. Bowden and met Lt. Lord Mr. Fosbrook and Mr. Janson calld in the evening
Wed. C.S. The King	4	am at 8 the Colours were hoised on Hunters Island in Honor of the Day. At 12 the Military fird three Rounds and a Salute of 21 Guns were fird in Honor of the Day. At 1 self Capt. Sladden Johnson Lt. Lord paid our respects to His Honor who though very ill receivd us and took some wine with him. The day was remarkably fine
		June 1806
Thursday C.S. Enfield	5	am I waited upon His Honor who was better. I dind with Capt, Johnson at 5 pm
Friday C.S. Barnet	6	am early this morn I went to Ralph's Bay with my gun had very bad success returnd in the Eve at 7 to Dinner I observed a strange sail in Frederic Henry Bay
Saturday C.S. St Albans	7	am this morn the Judge Advocate and Majestrates met upon Business At 5 pm I dind with Mr. Fosbrook and met the Judge Advocate Mr. Harris and Mr. Janson Bowden. I gave information to the Govnr of the ships in Frederic Henry Bay
Sunday C.S. Watford	8	am Divine Service could not be performd at 10 three Whales in front of my House Mr. Collins sent 2 boats after them at 4 I dind with the Lt. Govnr. 6 Mr. Collins sent word to the Govnr that he had killd one of the Whales in Farm Bay a very cold day The Lt. Governor sent a Boat down into Frederic Henry Bay to see what ship it was
Monday C.S. Dunstable	9	am at 8 this Morn Mr. Collins men with 2 boats had the Whale in tow down the River to the Try works the Weather very fine in the Eve the Govmt Boat returnd from Frederic Henry Bay—the Ship was the Carlton Privateer from Liverpool the Capt was to come up as the next Morn to wait upon the Lt. Govnr
June 1806		Hobert Town Van Diemens Land
Tuesday C.S. Coventry	10	am at 12 the Lt. Govnr sent to me upon business the Capt of the Carlton came to Hobert Town and waited upon the Lt. Govnr

Wednesday C.S. Carleton Parole Halcrow	11	am this morn we had the severest frost we have experienced in this country this day His Honor the Lt. Govnr keept the anniversary of His Majesty's Birth being unwell on the 4 of June at 12 the Military Paraded and fird 3 vollies and a Royal Salute was fird from the ordnance at 5 all the Civil and Military dind with the Lt. Govnr and Capt. Halcrow of the Carlton Letter of Mark from Liverpool
Thursday C.S. Bedford	12	am Capt. Halcrow of the Carlton Breakfasted with me. at 5 pm the Capt. and Mr. Lord dind with me this morn I calld upon the Lt. Govnr
Friday C.S. Broughton	13	am the day very fine at 12 I went out and killd some Wattle Birds pm Some Whales opposite the Town
		June 1806
Saturday C.S. Willingborough	14	am this morn the magestrates met upon business
Sunday C.S. Northhampton	15	am at 12 the Lt. Govnr sent for me upon business and I soon after sent Sargt M.Cauley, Billingham Perry and in search of 2 Prisoners that we absent from the camp Hobart Town
Monday C.S. Deventry	16	am at 11 I took my boat and went out afishing. Had very good luck Capt Johnson's 2 Men came from Pitt Water and informd his Master that Brown one of his men was wounded by a spear which the Natives had thrown at him and killd 2 Doggs and wounded one. The Natives took 3 Kangarros from the men at 5 pm Capt Johnson Lt. Lord and Mr. Bowden dind with me
Tuesday C.S. Royal Marines Parole Buncars Hill	17	am this morn much Rain and blowing fresh from the South my men went up the River with my Dogs. at 11 a Gale of wind from the S.W. in the Eve Do. Wr.
Wed. C.S. Tempest	18	am this morn blowing very hard with rain
		June 1806
Thursday C.S. Leicester	19	am at home all the day busy in my Garden at 1 pm I calld upon the Lt. Govnr
Friday C.S. Mowbray	20	am at 12 Lt. Lord and self walkd to the Farm upon business at 5 pm he dind with me very cold in the eve. My men brought home 9 Kangarros.

Saturday C.S. Nottingham	21	am the Wr. very cold and a sharp frost this is the shortest day in the year at 11 I calld upon the Lt. Govnr ½ past went to the Court where the Magestrates were upon business at 5 pm I dind with Capt and Mrs. Sladden met Capt Johnson the wr. very cold.
Sunday C.S. Buxton	22	am the day very cold at 12 Cap Johnson calld upon me and we took my Glass and observd 2 Boats of Mr. Collins fast to a Whale ½ past 1 we calld upon the Judge Advocate 4 pm I dind with His Honor the Lt. Govnr this morn the Lt. Govnr sent a Boat into Storm bay passage to see if there were any strange ships there
Monday C.S. Langley	23	am at home all the day. My men went out with my Doggs
Tuesday C.S. Judbury	24	am the day fine but very cold at 3 pm a Boat arrived from Adventure Bay from the Ocean Whaler Capt Bristow at 5 pm I dind with Capt Johnson and met Capt. Sladden and Lt. Lord

June 1806

Wed. C.S. Antrobus	25	am at 11 the Magestrates met upon business, many whales in the river.
Thursday C.S. Ocean	26	am at home all the day. very fine wr. but Cold
Friday C.S. Macclesfield	27	am at 3 pm Cap Halcrow came up in his boat and brought a man with him that was wounded by a Whale he dind with the Lt. Govnr
Saturday C.S. Macclesfield	28	am at 9 Capt Halcrow calld upon me at 5 pm he dind with me and Capt. Johnson and Lt. Lord. In the Eve much rain
Sunday	29	am Do. wr. at 9 I Breakfasted with Lt. Lord the day fine but very cold at 5 pm Capt Halcrow and self dind with Lt. Johnson
Monday C.S. Bolton	30	am this morn Capt. Halcrow went down to his ship. at 8 pm Capt Johnson and self dind with Lt. Lord.

July 1806

Tuesday C.S. Blackburn	1	am at ½ past 8 Capt Johnson and Lt. Lord went down in my Boat to Storm Bay Passage to go on Board the Ocean whaler Capt Bristow at 10 pm they returnd and in coming back the Boat was chased by a Cow Whale. She struck at the boat but fortunately she did not hit it with her fins.

Wed. C.S. Preston	2	am at 12 I took my dogs out to kill a Kangaro I see only 1 Bush Kangarro and the dogs did not kill
Thursday C.S. Kerkham	3	am A great quantity of Rain fell this morn at 11 I waited upon His Honor the Lt. Govnr. in the Eve Do. wr.
Friday C.S. Barton	4	am at 11 I went to Risdon in my boat the day fine at 4 I came home
Saturday C.S. Lancaster	5	am upon Business this morn the day very wet, and many Whales opposite the House
Sunday C.S. Kendal	6	am the day very fine but cold
Monday C.S. Penrith	7	am many Whales in the River at 4 pm Capt Halcrow came to the town from his ship and dind with me
Tuesday C.S.	8	am at 9 Capt Halcrow and self took a walk to the Govmt Farm and killd some Wattle Birds. Capt Halcrow and self with Mr. Bowden dind at Lt. Lord's
Wed. C.S. Carlisle	9	am this Morn a very severe frost at home all the day
Thursday C.S. Longtown	10	am I breakfasted with Lt. Lord and Capt Halcrow
Friday C.S. Edingburgh	11	am at 11 Capt Halcrow and self went out with my Dogs to kill Kangarro no success at 5 pm he and Lt. Lord dind with me
Saturday C.S. Gretna	12	am this morn we Breakfasted with Lt. Lord and at 3 pm Capt Halcrows 2 Boats came up the River in search of Whales. his Ship came from Frederic Henry bay and anchordd in the River
Sunday C.S. Glasgow	13	am at 11 I calld upon His Honor the Lt Govnr at 1 pm Lt. Lord calld and Cap Johnson upon me 4 pm I dind with the Govnr
Monday	14	am at 12 I went with my Boat to the Carlton Capt Halcrow who was awhaling down the River at 3 pm I got on Board. They were busey in boiling the blubber 5 pm two Boats came up with a large Whale

Cole was punishd by order of the Lt. Gov. for stealing a copper tea kettle and selling it to Mrs. Thorne. Mrs. Thorne knew that it was stole from Mrs. Hobbs because Cole said a week before that he would get her one, and she paid Cole 7 or 9 Gills of Spirits for it. Cole

Tuesday —set the boy Appleby to sel it to Mrs. Thore the boy livd with Thorne at the time	15	am at 10 Capt. Halcrow and self went on shore in my boat his Boats went off after whales 3 pm we got on Board. Lt. Lord came to the ship and Cap Bristo of the Ocean Whaler 4 pm Capt Halcrow Boats brought up a very large Whale
		July 1806
Wednesd	16	am this morn blowing very fresh from the South we remain all on board Capt Halcrow Boats out awhaling 4 pm the Boats returnd with a very large whale 5 moderate wr and Capt Bristo went on board his ship
Thursday C.S. Gallowway	17	am the whale that they brought on board yesterday made 90 Barrels of Oile. We dind on Board at 3 pm Mr. Lord and self came to Hobart Town In the Eve I suppd with Lt. Lord
Friday C.S. Glenlance I put 1 acre of wheat in	18	am this morn I calld upon the Lt. Govnr. Capt Bristo at Hobart Town Capt Moody of the King George Whaler came up
Saturday C.S. Port Patrick	19	am at 9 Capt Bristow calld upon me. at home all the day Capt Halcrow came up this aft and Capt Moody went to his ship
Sunday C.S. Wendover	20	am at 10 the King George Whaler Capt. Moody anchord in the Bay the distress of the Colony for want of Grain that the Rations are as viz to the Officers 3 lbs of Wheat and 8 lbs of Kangarro. To the Prisoners 2 lbs of Indian Corn and 8 of Kangarro
		July 1806
Monday C.S. Trig	21	am at 11 Capt Johnson and Cap Halcrow and self walkd to Sandy Bay. at 5 pm we dind with Capt Johnson and met Capt Sladden
Tuesday C.S. Hardwick	22	am at home all the day Capt Halcrow dind with me
Wed. C.S. Winslow	23	am this morn I went to Sandy Bay at 4 pm I dind with Lt. Lord and met Capt Bristow.
Thursday C.S. Banbury	24	am at 11 I walkd to Sandy Bay and returnd at 3 ½ past 4 Capt Johnson Lt. Lord and Capt Bristow dind with me Mc sent for me late in the Eve
Friday C.S. Discover	25	am at 3 some persons unknown set fire to the Hospital with an intention to burn Bootham in it but fortunately he was awake when it first broke out. they set it on fire three places, everything was burnt in the Hospital 212

pairs of sheets besides Blankets and Bed. the Lt. Governor gave a General Reward this day of 100 Pounds & a free pardon and Passage to England if any one would discover the insenderies.
at 5 pm I dind with Capt. Johnson and met Capt Sladden & Lt. Lord

July 1806

Saturday 26 C.S. Attempt — am busey in sowing wheat this aft calld upon His Honor on business

Sunday 27 C.S. Oxford — am this morn much rain and very cold at 10 snow 4 pm do. wr.

Monday 28 C.S. Warwick — am the mountain covrd with snow at home all the day

Tuesday 29 C.S. Stratford The Red Cow Calfd — am engaged all this morn upon Magestrate business upon Newland &c at my House the day very cold at 5 pm Capt Halcrow came up to Town sent my letters to go with the Govmt dispatches

Wednesd 30 C.S. Dispatch — am at 4 the Govmt dispatches went down to the King George Capt Moody at 10 I went out with my Gun and killd a Kangarro Capt Halcrow and Lt. Lord dind with me at 5 pm
This morn saild the King George Whaler

Thursday 31 C.S. Avon — am at home all the day upon business

August 1806

Friday 1 C.S. Worcester — am at 7 Lt. Lord and self went in the Govmt Cutter to Capt Bristows ship in Storm Bay passage. at 3 pm we got into the boat again and Capt. Bristow came up with us We see a great many of the Natives both men and women they were friendly

Saturday 2 C.S. Bromesgrove — am busey this morn in writing letters

Sunday 3 C.S. Dudley — am engaged in writing letters to England. at 8 pm calld upon the Lt Govnr who took my letters and closed them with his Dispatches Mr & Mrs. P. Lt. Spencer Mr. Tustin Mr Collins.

Monday C.S. Good Voyage	4	am at 8 I see Capt Bristow who was going on board his ship Mrs. Bate went as passenger and Mrs Folkoner the Morn very cold. at 10 saild the Ocean Whaler from Storm Bay passage for England Capt Bristow at 1 pm I went out afishing at 3 it raind and was obliged to return. 8 do wr. which continued all night.
Tuesday C.S. Simmonds	5	am at 4 I was informd that a ship was come from Sydney the Estremina Brig with Provisions for the Colony Lt. Simmons in the H.M. Brig Estremina. at 1 pm information was given that a ship was standing up the River. 3 pm she anchord in the bay the Criterion Capt Chace from Sydney last cargo of Tea Nankein & China 5 pm Capt Sladden Johnson Lt. Lord and Lt. Symonds dind with me all very merry—and exceeding wet day. When the Estremina arrivd we had only provision for 2 servings—a weeks—
Wednesd. C.S. Chace	6	am the Weather very wet by Lt. Symond we had the infermation that the Venus brig commanded by Mr. Chace was taken by the Prisoners at Pt. Dalrymple and ran away with. She had property to a very large amount £10.000 both for Pt Dalrymple and this Colony. for me there were 30 gls of Spirits and a Barrel of Porter
Thursday C.S. Bridgenorth	7	am at home all the day very wet at 5 pm Capt Sladden Lt Lord & Lt Simonds and self dind with Capt Johnson
Friday C.S.	8	am at home all the morn very wet I breakfasted on board the Estremina Lt. Simmonds, 5 pm the same party dind with Capt Sladden much wet.
Saturday C.S. Shrewsberry	9	am at home all the day. this morn I sew some garden seeds from England Peas and Beans altho the day very wet
Sunday C.S. Nantucket	10	am at 12 Capt Halcrow calld upon me 2 pm saild the Criterion the Merichan ship commanded by Mr Chace
Monday C.S. Return	11	am at 9 I went on board the Estremina Lt. Symonds to Breakfast. at 11 Capt Halcrow calld upon me. 5 pm I dind with His Honor Lt. Govnr Collins and met Capts Sladden and Johnson Lt. Lord Lt. Simonds R.N. Capt Halcrow of the Carlton Letter of Marque very busey at work at my Garden
Tuesday C.S. Drayton	12	am at 8 the Colours were hoisted on Hunters Island at home all day not well
Wednesday C.S. Simon	13	am busey at my Garden all day.

Thursday C.S. Overton — 14 am at 8 saild the Estremina Lt Simmonds for Port Jackson. at 4 pm Capt Halcrow dind with me. I sent His Honor a young Pigg Capt Johnson & Mr. Bowden calld upon me

Friday C.S. Denbegh — 15 am this morn busey at home. At 1 pm I calld upon His Honor Lt. Govnr Collins very busey in my Garden

Saturday C.S. Chester — 16 am at home all the morn upon Business

Sunday C.S. Flint — 17 am the morn very wet 4 pm I dind with His Honor the Lt. Govnr

Mond. C.S. Holiwell — 18 am the day very wet at 3 pm the Carlton Letter of Marque stood up the River at 6 she anchored on the East side of the River wind contra for her coming up—

August 1806

Tuesday C.S. Halcrow — 19 am at 8 the Carlton Letter of Marque working into the Bay ½ past 11 she anchord and fird salute which returnd by the Garrison 1 pm Rainy and squaly weather. In the eve much lightning

August 1806

Wed C.S. Normans Cross — 20 am the day very wet and blowing hard in the Eve much Lightning

Thursday Honour — 21 am at 11 I calld upon His Honor the Lt. Govnr. 5 pm I dind with Capt Johnson and met Capt Sladden Lt Lord Capt Halcrow

Friday C.S. Victory — 22 am at 8 the Colours were hoistd on Hunters Island the Lieut Governor having appointed this day to be observed as a day 4 Thanksgiving, for the late glorious success which attended His Majesty's arms over the combined fleet of the Enemy off Cape Trafalgar on the 21 day of October last. Divine Service was performd and attended by Every Officer Civil and Military settlers free People and the prisoners, every person attended that were not prevented by sickness at 12 a Royal Salute was fird from the Ordinance on the Parade and Capt Halcrow fird a Royal Salute from the Carlton Letter of Marque, the day was very fine but cold

August 1806

Saturday C.S. Peterborough	23	am at 11 I waited upon the Lt. Govnr 12 the Govnr Mrs P. and Capt Halcrow self went in his Cutter to the Farm where we dind and in the Eve returnd home to Tea the day very fine
Sunday C.S. Boston	24	[Here one day is cut from the original Diary]
Monday C.S. Newark	25	am the day very fine sowd an acre of Wheat and had it Chippd in Capt Sladdens sale was this morn and one pound of Tea was sold at the enormous Price of Six Guines a Pound and bought by Lieut Lord the day very fine
Tuesday C.S. Hull	26	am the day very fine busey in Chipping in some wheat and making a hot bed the day very fine
Wed. C.S.	27	am at home all the morn busey in planting Pot 8os all my men employd in my Garden at 4 pm I went with the Lt Govnr in his boat on board the Carlton Capt Halcrow to dinner when on board he fird a Salute of 9 Guns we spent the day very pleasant at 9 came on shore when he fird a Salute again
Thursday C.S. Atton	28	am at home all the day busey at my Garden in planting Pot 8os and making beds for the Carrots which I sowd the seed came from England
Friday C.S. Ashbourn	29	At home all the morn 2 calld upon Capt Halcrow on board the day very fine busy

August

Saturday C.S. Axminister	30	am at home all the morn busy in planting and sowing seeds in my Garden, at 5 pm I dind with the Lt. Govnr and Capt Sladden and Capt Halcrow
Sunday C.S. Bampton	31	am this morn I went on board the Carlton Capt. Halcrow to take some Ham &c &c at 4 pm Capt and Mrs. Sladden embarkd on board the Carlton Letter of Marque Capt. Halcrow, to take their passage to England Capt Sladden being recalld by the admiralty to join his division at Chatham

Memorandum ad Salisbury

September 1806

Monday C.S. Bangor	1	am at home all the day busy at my Garden planting potatos. at 8 am I launch my new Boat calld the Spencer

Tuesday C.S. Barnet	2	am do employd Capt Halcrow calld upon me at 1 pm I went on board at 3 and took Ham &c. sent my new boat to be riggd.
Wed. C.S. Dispatch	3	am this morn finished all my letters and at 1 pm took them on board sent my swans and at 4 pm went on board with Captain Sladden Lt. Lord Cap Halcrow to dinner. at ½ past 6 Captain Johnson came on board with the Government Despatches. the day very fine I put some of Coll Astleys Melons into the bed at 9 I came on shore with Capt Sladden to take leave of the Lt Governor &c
Thursday C.S. Carlton	4	am at 7 saild the Carlton Letter of Marque for Liverpool Capt Halcrow and saluted with 13 Guns the day very fine blowing fresh at 10 from the N.W. at 1 I took my new boat and went out afishing very poor sucess
Fridav C.S. Bedford	5	am busey at working in my Garden sowing seeds &c. &c
Saturday C.S. Beverley	6	am do employd all the morning in the aft I went out asailing. Blowing fresh 7 pm rain
Sunday C.S. Blackburn	7	am at home all the day 5 pm I dind at Capt Johnsons at the new House which he hird of Lt Govnr Collins. Late Capt Sladden's House
		Sept 1806
Mond C.S. Boulton	8	am this morn I finish sowing the Wheat 4 pm Sowd Gooseberrys and Currents and planting Potatos.
Tuesday C.S. Brackley	9	am at home all the Morn. 5 pm Capt Johnson and his friend dind with me
Wed. C.S. Brandon	10	am busey in the Garden at 1 pm went up to the Farm in my boat and walkd home the day very fine Land and Sea Breeze.
Thursday C.S. Brentford	11	am at home all the day busey in my Garden, everybody wishing for the arrival of a ship with provisions having only a fortnight's in the Store
Friday C.S. Bridport	12	am at home all the day the mountain coverd with Snow
Saturday C.S. Broadway	13	am busey upon business

Sunday C.S. Birford	14	am the day very fine at 5 pm I dind with Lt Lord and met Mr. Bowden
Monday C.S. Vigilance	15	am ½ past (11)? I took a long walk with the Govr. 1 pm took a Sail in my New Boat
Tuesday C.S. Buxton	16	am only Two Pounds of almond meal given out at the Store for the officers per week and not a single Grain of Corn or meal left for the Prisoners nor have we any more in the store
		Sept 1806
Tuesday C.S. Buxton	16	At sunset this Eve a Military Patrole was appointed whose duty commences at the beating of the Retreat in the Eve, and continues until Reviellie beating in the morning. the military Patrole consists of 1 Sargt, 1 Corp, and 6 Privates
Wed. C.S. Cullington	17	am at home all the day with my men busy in the Garden
Thursday C.S. Cardiff	18	am do employd every body much dejected having no provisions to supply the Colony with the Lt Govnr went and returnd home to dinner
Friday C.S. Relief	19	am at ½ past 11 I waited upon the Governor, busy in sowing seeds &c in my Garden
Saturday C.S. Chatham	20	am at 11 the Lt Govnr sent his compts and requested I would sit and Try some Prisoners. pm ½ past 2 Lightning and Thunder with a little rain the day very warm put some long Turkey Cucumbers into the Bed. Not an ounce of Meal Wheat or any thing to be servd to the Military or Prisoners, none in the Store for any one
Sunday C.S. Carlisle	21	am at home all the morn 4 pm I dind with His Honor the Governor. much rain all the aft and Eve
		September 1806
Monday C.S. Chepstow	22	am at home all the day the wr. very fine
Tuesday C.S. Chudleigh	23	am at 9 I took my boat and went into Ralphs Bay ashooting and killd a Black swan. saw some very fine Ducks but could not kill any return home to dine at ½ past 7 pm blowing very hard—

Wednesday C.S. Clare	24	am at home all the day. Everybody impatient for the arrival of a ship
Thursday C.S. Colford	25	am this morn sent my men out after Kangarros and went myself afishing very good success
Friday C.S. Cornhill	26	am at home all the morning at 1 pm took my boat and went afishing caught but very few
Saturday C.S. Cowes	27	am Engaged this morn upon the bench from 9 to ½ past 12 by myself,—the Prisoners very greatly distressed for provisions not any flower Meal or Maize in Store. this day things sold at the following price Biscuit 4s per lb, Meal 3s/6d do. Maze 2s/3d do. Tobacco not fit to be made use of 2s/6d per inch. the Cololy very greatly distressd for everything and every body crying out for the want of Bread, sugar 5s/- per lb, Rice 2s/6d and Kangarro at 1s/- per lb.
		September 1806
Sunday C.S. Cranbury	28	am this morn calld upon the Governor to thank him for some fine Mutton which he sent me. at 1 calld upon Capt Johnson
Monday C.S. Crayford	29	am this morn went out afishing before Breakfast opposite my House caught a few. at 1 pm went out again it came on to rain so hard was obliged to return in the Eve Do. wr. the Drum beat the Taptoo at 9 am this Eve
Tuesday C.S. Cromer	30	am at 8 Blowing hard from the North the morn very cold after the rain at 11 upon business till very late
		October 1806
Wednesday C.S. Croydon	1	am Early this morn the following Prisoners deserted from Hobart Town Wm Jones Jarret Tombs and Crute. the Morning fine after the Gale at 1 pm I went up the River with my Men as far as the farm, that Sculler might detect my Man Earl in using some of my seasond wood &c. for Bedsteads and table at 3 I returnd when Sculler informd me that he had taken Earl and with timber was putting the bedstead together In the eve I waited on the Gover and requested him not to punish Earl but begd of him to give him a reprimand the table was for Stoker and the bedstead though he would not acknowledge it

Thursday C.S. Dalkeith — 2 am this morn at 10 the Govnr Releasd Earl with a reprimand at 1 pm I went out afishing and took Earl with me. In two hours opposite my house we caught in the Bay 5 Dozen of Rock Codd and I Dozen flatheads the weather was rainy and blowing a Gale from the W.N.W.

Friday C.S. Danbury — 3 am this morn went out afishing had very bad success blowing hard from W.

Saturday C.S. Dartford — 4 am at 6 this morn I went out afishing caught very few for Breakfast the distress of the town very great for want of Provisions scarce any Provision for the Marines and Prisoners, At 11 lent my new Boat to some Marines to get some fish having nothing else to eat Potatoes 2s a lb and Flower sold by Mr Bate the D.J. Advocate at 6s per lb. Mr. Collins this morn went upon Mount Direction to look for a ship the day very cold blowing hard from S. West. Caught very few fish amidst all this scarcity of Bread &c at this season we have scarce any vegitables the Potatoes are all in the ground

Sunday C.S. Deal — 5 am the Morn very cold blowing hard My Man and a party of Marines went out afishing had very bad success at 12 calld upon His Honor the Lt. Govnr he complaind very much for the loss of Kangarro none being in the Store and it is generally believed that the prisoners which are in the bush had taken many of the Gentlemens Dogs. the wind blowing very hard this morn a party of 5 went into the Bush blowing hard from the S. West.

Monday C.S. Dover — 6 am the wind continued all night. at 1 pm blowing a very heavy Gale from the West at 3 M Mansfield came down to the Governor who informd him that there was a ship arrived in Frederic Henry Bay and that an officer of the R.Ms and Henry Hakin was at his house. the Lt. Govnr sent a Boat up for them the same Eve they landed the ship was the King George Whaler from Sydney

October 1806

Tuesday C.S. Henderson the New Officer of Marines — 7 am at 10 Henry Hakin the Pilot calld upon me and informd me that the distress at Sydney was greater than here there were no Grain or Flower of any kind and that some People had died through want. at 1 pm I waited upon the Govnr who read me a letter from Govnr Blyth the new Govnr and likewise of the new Ministry in England. Mr. Fox Secretary for the Foreign Department and Ld. Spencer for the Home &c &c &c. at 2 Capt Johnson and Lt Henderson the officer which came from England calld upon me. Lt. H. came to relieve Capt. Sladden and that Lt Breedon who was on board the King George to relieve Capt Johnson who is recalld by the Admiralty. I had a letter from the Revd Mr Marsden a very great change of affairs in England

Wednesday
C.S.
Deptford
8 am at 9 I took my 3 Men with Guns and sent to kill a Kangarro we had very bad success the ship did not arrive came home at 5 pm

Thursday
C.S.
Derby
9 am at ½ past 5 I sent my Men down to Browns River to kill some Ducks &c &c at 10 sent my New Boat to Capt Johnson and Lt. Henderson to go down the River Capt Johnson informs me that he was going to England by the return of the King George. this day three years at 20 minutes past 10 am we arrived at Port Phillip

October 1806

Friday
C.S.
Breedon
the officer of Mar
10 am at home all the day, in the Eve we had a fine shower at 3 pm arrived the King George whaler Mr Moody from Sydney with a supply of Salt Provisions

Saturday
C.S.
Moody
11 am upon business all the Morn at 1 pm I waited upon the Lt Govnr Receivd a box from Salisbury and likewise letters from My Agents and Capt Bowen &c &c

Sunday
C.S.
Doncaster
12 am at 11 Capt Johnson and Lt Breedon calld upon me at home all the day

Monday
C.S.
Dudley
13 am at 5 went out afishing at 11 engaged upon business I Xnd Mrs Sargents child and took lunch at Mr. Bowdens. Waited upon the Govnr the day very fine, It is truly lamentable to see the distress that the people are in not a Man able to do any work, what few there are employd in unloading the King George the Lt Govnr is obliged to give them Pork and beef 4 lbs a man, all our Poultry are dying having nothing to give them the poor Piggs &c &c are all dying and at this Season we should have young ducks and Chickings My poor pigeons are all most dead for want of Provisions only 4 remaining out of 16

Oct. 1806 October

Tuesday
C.S.
Dunbar
14 am at 11 waited upon the Lt. Govnr 5 pm all the Civil and Military officers dind with Mr. Bowden. This eve at ½ past 5 Sargt MaCaulay was fird at by some of the prisoners as he was going his rounds as Sargt of the Patrole

Wed.
C.S.
Dunmon
15 am at home all the day

Thursday
C.S.
Durham
16 am at home all the day preparing letters for England

Friday C.S. Edgeware	17	am this morn the Govnr sent for me upon Magistrate business and engaged till 11 to 2 pm calld upon Capt Johnson
Saturday C.S. Selkirk	18	am at 12 waited upon the Govnr with my letters who took them with his Govmt Dispatches
Sunday C.S. King George	19	am ½ past 6 saild the King George Mr Moody the day exceedingly Hot blowing hard from the North a very hot wind at 7 pm Lightning and at 9 Rain

October 1806

Monday C.S. Egham	20	am this morn the investment that come from England was disposed of at Mr. Fosbrooks at 12 went to the Island for some Spirits 15 Gallons of Rum afterwards out afishing no Success. In the eve at ½ past 9 Lightning
Tuesday C.S. Nelson	21	am at 4 the Men came and drew the Seine opposite my House and caught a great many fish at 8 blowin very fresh from the North. Engagd upon business this day Twelve Months the ever memorable Battle of Trafalgar was fought. at ½ past 9 a Signal was made that a strange sail was in the River. in the Eve Lightning
Wed. C.S. Skelton	22	am at 4 the Pilot boat went down the River and came up at 9. 11 the ship Ferret Letter of Marque a Whaler blonging to the House of Bennet and Co. London commanded by Capt Phillip Skelton anchord in the Bay she left England on the 3rd of June 1806 and stopd only at St. Jago Praye Bay
Thursday C.S. Egham	23	am the Morn cold at 12 waited upon the Lt Govnr

October 1806

Friday C.S. Exeter	24	am at home all the Day at 8 pm I waited upon the Lt Govnr and gave him the information of Thos Jones a convict having killd a cow at 9 we took the Man and confind him in the Guard House
Saturday C.S. Exmouth	25	am at home all the morn
Sunday C.S. Proclamation	26	am at home all the day I gave 3 shillins and 6 pence for a peice of Mutton

Monday C.S. Fareham	27	am at 11 Engaged upon business on the Bench
Tuesday C.S. Furnham	28	am the distress of the Colony beyond conception meat 3s/6d a lb Coarse meal 9s and potatoes 1s/6d a lb Indian Corn 7s/- a lb and very bad and a very little to be obtaind. no work to be done the poor people go out afishing &c
Wednesday C.S. Flint Nettle pup'd	29	am at 6 I went in my Boat down to Browns River afishing and took my Gun Killd 4 Ducks returnd at 6 pm to Dinner My Pigeons dying for want of Provision and Poultry, finishd every grain of corn &c for my Pigeons,
		October 1806
Thursday C.S. Forfar	30	am at home all the morn 5 pm I dind with Capt Johnson, and met Lt. Lord and Breeden, Mr. Bowden
Friday C.S.	31	am at 11 I went out afishing 5 pm Capt. Johnson Lt. Lord & Breeden
		[Here the remainder for this day is cut from the original Diary]
Saturday C.S. Duckworth	1	am at 11 I waited upon the Govnr 12 went to Captain Johnson's when we took a walk. At 6 pm the Govnr punishd 6 Men from the ship Ferret with 100 lashes each because they refusd to let 2 casks of Biscuit and 3 of Flower land for the relief of the Colony. in the Eve I calld upon Mr. Groves.
Sunday C.S. Glasgow	2	am at home all the day. this day I had some strawberrys out of my Garden and likewise Green Peas
Monday C.S. Glociester	3	am in the Morn waited upon the Govnr and sat upon business afterwards
		November 1806
Tuesday C.S. Greenwich	4	am at 11 waited upon the Lt Govnr, afterwards took a walk with my Gun. Mr. Bate calld upon me upon business at 3 pm a little Rain. 4 Conolly brought me a little Black cat. this day we had 2 lbs of Biscuit and 1 lb of Flower a week each man a very great relief to the Colony
		[Here one day is cut from the original Diary] [See also Friday 31st October]

Thursday C.S. Gravesend	6	am at 12 I waited upon the Lt. Govnr upon business the weather very dry for want of Rain
Friday C.S. Guildford	7	am upon business all the morning afterwards took a walk with my Gun but did not see any Pigeons
Saturday C.S. Hadleigh	8	am at 11 the Govnr sent for me upon business afterwards came home and went out with my Gun did not get a shott the weather very dry. Nothing grows for want of Rain

November 1806

Sunday C.S. London	9	am at home all the morning. 3 pm calld upon Capt. Johnson at 4 dind with His Honor the Govnr 8 some rain This day veal was dressd at the Govnr Table bought of Capt Johnson
Monday C.S. Halifax	10	am at home all the morning
Tuesday C.S. Halstead	11	am at Court all the morning afterwards went up the River in my boat and landed oposite Risdon and walkd home kill one Pigeon
Wednesd. C.S. Hammersmith	12	am at 6 I got into MaCauleys Boat with 4 men and went into Ralphs Bay after ducks had very bad success returnd home at 5 pm
Thursday C.S. Hampton	13	am at 11 waited upon his Honor the Lt Govnr. 2 pm went out afishing anchord in the Bay the Ferret whaler from a Cruse, she did not kill any whales. Rain very much wanted.
Friday C.S. Harewood	14	am engaged upon the Bench all this morn. After 10 Prior to that I sent for Warriner, about his misconduct.

Hobert Town November 1806

Saturday C.S. Harlow	15	am at 11 I went out afishing the day very hot, caught some very fine Perch the ground very much in want of Rain and the grubbs destroy all our vegitables
Sunday C.S. Harrow	16	am at 11 waited upon the Govnr. at home all the day
Monday C.S. Hartland	17	am Since this day 12 months we have had only one Burial and that an infant 3 days old. the day very hot. Thermomiter at 12, 78 4 pm 98½ . this morn Early my men went down the River in Mr. Groves Boat and his 2 Men

Tuesday C.S. Harwich	18	am Early this Morn we had a very fine Shower of Rain at 9 the earth very much refreshd with it. 3 pm very fine Moderate Rain, we may truly bless God for the Rain, which has destroyd Thousands of Grubbs all our Gardens and the Corn was very much destroyd by them at home all the day Sowing Seeds and planting in the Garden
Wednesday C.S. Hastings	19	am very fine rain this morn at 11 I walkd out with my Gun to kill a Pigeon could not see any at 2 rainy wr. 4 pm do wr.
		Hobert Town November 1806
Thursday C.S. Havant	20	am the Morn dark and Cloudy with showers at ½ past 10 went upon the Parade, took a walk with the Govnr, and returnd to his House at 12 . 1 pm took my boat and went afishing caught some, and a very large shark. the Gardens and everything very greatly refreshd after the delightful Rain
Friday C.S. Hay	21	am this morn engaged upon the Bench afterwards came home and busey in my Garden many very fine Strawberrys ripe and Green Peas—
Saturday C.S. Helstane	22	am at home all the day
Sunday C.S. Henley	23	am the morning very hot 1 pm Capt Johnson and Lieut Breedon took a Sandwich with me 4 pm do. wr.
Monday C.S. Hertford	24	am at 9 I went down the River into Ralphs Bay and see the Try Works with Mr. Groves at 2 came to Sandy bay caught some fish and dressd it, the wind very strong from the South
Tuesday C.S. Highgate	25	am this morn blowing fresh from the South
Wed. C.S. Hindon	26	am this morn we had a very fine shower of Rain, at 12 Do. wr. which continued all the aft till 5 pm ½ past 5 Capt Johnson Lt. Lord and Breedon Mr Janson and self dind with the Govnr
Thursday C.S. Hinkley	27	am this morn Early My Two men that were absent since Monday senight returnd they first went to N.W. Port in Storm Bay Passage where they had bad success from thence they went into Frederick Henry Bay there they had good success, but the natives took from them 9 Kangarros while they were hunting and their Boat which they found

again in 3 days search. at 12 went out in my Boat killd a couple of Ducks returnd home at 6 pm to dinner. this Eve Hunter Roberts and Story three Prisoners which have been absent in the woods for 5 months came and surrenderd themselves up to the Night Watch

November 1806

C.S. Hithe Friday 28 am the morning wet at 11 sat upon the Bench trying several of the Prisoners the aft very Stormy with Rain wind blowing very hard from the West.

Saturday C.S. Hockliffe 29 am at 8 got into the Boat went across the River sent 2 men out akangarroing Self and Earl took guns and went after some ducks at a Lagoon I see three Snipes and had the good luck to kill 2. the first On my return home I gave them to the Governor who wrote me the following Note.

Dear Sir,

I feel much obliged for your handsome Present of what I did not know we had in this Country and which I with Pleasure accept as a very great treat.

Yours truly
David Collins

29th Nov. 1806
Revd R. Knopwood

The first Snipes killd in this country

Earl killd a couple of Teal

Sunday C.S. Hockley 30 am the morn very cold and blowing exceeding hard Squalls from the W.N.W. this morn calld upon His Honor the Lt Govnr blowing hard all the day

Monday

December 1806

Monday C.S. Holt 1 am at 9 Sat upon business 11 took my Boat and went across the River with my man Gains and Richardson who informd me that, Fossett had taken away my Bitch Miss on Saturday while they were asleep and had taken all their pork and an Iron Kettle, very bad success in shooting and fishing

Tuesday C.S. Holiwell 2 am at home all the Day sent Gains Moffat Richardson in search after my Bitch Miss

Wed. C.S. Hornby 3 am this morn the Govnr sent for me upon business. At 12 calld on business upon Capt. Skelton all home the remainder of the day

Thursday C.S. Horndean 4 Upon business Trying Capt Skeltons Steward who had robbd him of many things. this aft shot a couple of Pigeons.

Friday C.S. Hornsey 5 am at Court all the morn till late, the day remarkably cold blowing very hard from the West, at 5 pm snow upon the mountain at 9 Lightning from the East

December 1806

Saturday C.S. Hull 6 am at home all the day none of my men returnd from looking after my Bitch Miss which was stole from them on Saturday 29 Nov. by Fossett one of the Bush rangers. this day Capt Skeltons Steward was punished for neglecting his Master and taking property belonging to the Ship Owners and making away with Biscuit Tea &c &c

Sunday C.S. Huntingdon 7 The Morn very cold at 10 Rain. 11 performd Divine Service attended by His Honor the Lt Govnr &c &c. at home all the day

Monday C.S. Ilford 8 am at 11 My Men returnd from the Coal River where they had been out after Fawcett who stole my bitch Miss on the 29 or 30 of November went out afishing but caught Nihil in the morn Early I sat upon the Bench to try some Prisoners

Tuesday C.S. Ipswich 9 am at home all the day employd in my Garden

Wed. C.S. Eclipse 10 am this morning Early I went down to Browns River Killd 3 ducks and caught some fish returnd home to dinner at 7 pm the Eclips very visible and spoke of in Moors Almanack

December 1806

Wed. 10

Thursday C.S. Islington 11 At 6 this morn I got into my boat and went down the River afishing had very good success the wind blowing fresh from the S.W. at 11 the wind chang to the South a Sea Breeze observd many native fires, and the Natives ahunting dressd some fish in woods. at 4 pm made sail with a very strong Breeze at South and got home in an hour and a Quater distance 11 Miles. this day I had some very fine Beans out of my Garden the first I dressd. last year I was obliged to preserve all the seed of the Beans. they do not produce good crops in general.

Friday C.S. IxWorth 12 At 7 sent down the Boat to get some fish and Whale for the Dogs. this morn was detaind upon business no intelligence of My Bitch Miss the Mountain was coverd with snow blowing very fresh from the S.W. this Eve I drew Capt Johnsons seine—very bad success

December 1806

Saturday C.S. Kelso	13	At home all the day it was cold
Sunday C.S. Kendal	14	Early this morn being unwell I had occasion to go into the Garden where I see a Man very busy in diging up my potatoes, and went to him and found it was my Gardner Earl, stealing some at 11 performd Divine Service the Lt. Gov being unwell he did not attend. before the great scarcity of Grain and other Provision I had 8 pair of Pigeon and have now only 2 pair left the Lt Govnr at this time supplies me with a little hemp seed for them, if not they would have been all dead
Monday C.S. Kilburn	15	Upon business all the morning 2 pm we had a very fine shower of Rain which continued some time this morn Early Gains and Richardson went in search of My Bitch Miss with Mr. Bowden Men who has a Dog taken from him by the bush Rangers, I took Earl before the Govnr and I forgave him
Tuesday C.S. Kingston	16	At 11 this morn I went to the Farm and calld upon hays the Settler who informd me that Capt Skelton had promised her 6 Gallons of Spirits and a Dozen of wine in the aft sowd seeds after the Rain.
Wed. C.S. Kirkby	17	in the morn calld upon Capt. Johnson afterwards at home in my Garden. 4 pm while at dinner Mr. Williams the Settler brought my bitch Miss she came to him while he was at Dinner to his Farm

December 1806

Thursday C.S. Kirkham	18	am at 9 Mr Williams the Settler calld and I paid him 10£ the reward I offerd for any one that would bring my bitch to me at home all the day
Friday C.S. Kneetsford	19	am this morn engaged upon the bench and I had the following Prisoners to try myself being the only acting Magistrate in the Colony at 11 Capt Johnson Lieut Lord Lieut Breedon Mr. Bowden Surgeon attended at the Court.

	Lashes	
absent 8 weeks	300	Tho Tooms for absenting himself from Labour and Dog Stealing
„ 5 „	200	Burchall do.
„ 3 „	100	Plunkett do.
„ 11 „	300	Duff do.
	100	Crener for Robbing Kennedy's Garden after the Court I took a walk with the Govnr at 2 pm Capt Johnson Mr Bowden calld upon me

Saturday C.S. Lancaster	20	At 11 I went out afishing had very bad success the day cold & my man Earl killd me a couple of Ducks and a Pigeon the wind blowing hard from the West at 11 the punishment of the Prisoners took place
Sunday C.S. Langley	21	am at 11 performd Devine Service attended by the Lt Govnr &c &c a strong west wind all the Day the Longest Day
Monday C.S. Longford	22	at 11 I went out afishing and caught some flat Heads the wind blowing a strong Sea Breeze. came home to dinner at 5 pm at 6 went out again in the Bay opposite my House and caught some Rock Codd and a large Barracoote measured 4 feet 2 inches long and weight 6 lbs ½
Tuesday C.S. Lavington	23	At 11 the Govnr sent for me upon business he went to the Farm to Dinner the day very warm in the aft I went out afishing very bad success the country on fire all by Risdon for miles by the Natives
Wed. C.S. Leeds	24	am the day remarkably hot blowing fresh from the N.W. at 1 pm waited upon the Govnr. Thomas Salmon came in from the Bush Henry Hakin returnd from the Houin with 100 Swans which were deliverd to the Prisoners, in the Eve calld upon McCauley Xms Eve the day very hot at ½ past 3 pm the Thermomiter was 102.
Thursday C.S. Ætna Xmas Day	25	am at 11 performd Divine service and attended by the Lt Govnr Military and Civil officers &c &c the day was very hot at 3 pm the thermomiter stood at 105 in the shade the heat was so great that it bent the Glass of the thermomiter and broke it. 4 pm I dind with the Govnr off Roast Beef &c the first that was killd for the officers on Xms Day
		December 1806
Friday C.S. Leicester	26	the morning very hot at 12 waited upon the Lt Govnr—the Country all on fire at 2 calld upon Capt Johnson
Saturday C.S. Lincoln	27	the morning much cooler at 1 pm I went up in my boat with my men to the farm. They went aKangarroing the Country all on fire up to Herdsman Cove and likewise on this side of the River
Sunday C.S. Liphook	28	The morning very warm at 11 performd Divine Service taken unwell when at Lt. Lords at dinner this day was obligd to come home soon with a bad pain of my side Mr Bowden attended me

Monday C.S. Liverpool	29	very unwell all the day in the Eve was obligd to have a Blister applied to my side the Lt Govnr sent a letter to me to know how I was Mr. Bowden attended me Lt. Lord calld upon me
Tuesday C.S. Llandford	30	very ill all the day the Lt. Govnr sent his man to know how I was Mr Bowden attended me Lt. Lord calld upon me the wind blowing very hard from the W.N.W.
Wed. C.S. Lodden	31	At 11 Mr Bowden calld upon me this morn much better, the Lt. Govnr man came and requested to know if there was anything at Govmt House that I wanted in the aft much better, at 7 pm the Country very much on fire to the Westward and it approach up the mountain much the Eve dark and cold.

[The second half of this diary will be published in next year's volume.]

The Royal Society of Tasmania
1946

Patron:

His Majesty the King.

President:

His Excellency Admiral Sir Hugh Binney, K.C.B., D.S.O.

Vice-Presidents:

L. Cerutty, B.A., Dip.Ed., 1947.

W. H. Hudspeth, B.A., 1947, 1948.

Council:

S. W. Carey, D.Sc., 1947, 1948, 1949

W L. Crowther, D.S.O., M.B., 1947.

V. V. Hickman, B.A., D.Sc., 1947, 1948.

L. W. Miller, M.Agr.Sc., F.R.E.S., 1947, 1948, 1949.

J. L. Somerville, M.Sc., F.A.C.I, 1947, 1948

J. W. C. Wyett, B.Sc., A.A.C.I., 1947.

Hon. Secretary and Librarian:

Joseph Pearson, D.Sc. (Manchester), D.Sc. (Liverpool), F.R.S.E., F.L.S.

Assistant Hon. Secretary:

D. C. Pearse, M.C.

Hon. Treasurer:

S. Angel.

Hon. Auditor:

H. J. Exley, M.A.

Hon. Editors of the Papers and Proceedings:

Joseph Pearson.

D. C. Pearse.

Standing Committee:

W. L. Crowther, V. V. Hickman, W. H. Hudspeth, J. Pearson.

Annual Report, 1946

The Annual Meeting was held in the Society's Room, Tasmanian Museum and Art Gallery, Hobart, on the 5th March, 1946.

His Excellency, Sir Hugh Binney, attended for the first time as President of the Society. Prior to the meeting a deputation of the Society, consisting of the two Vice-Presidents and the Honorary Secretary, waited upon the Governor at Government House and asked him whether he would be so good as to accept the presidency of the Society, to which His Excellency agreed.

The following Office-bearers were elected:—

Vice-President: Under the Society's Rules, Professor V. V. Hickman retired from the office of Vice-President, and Mr. L. Cerutty was appointed in his place (retiring 1948).

Hon. Secretary and Librarian: Dr. Joseph Pearson.

Hon. Assistant Secretary: Mr. D. C. Pearse.

Hon. Treasurer: Mr. S. Angel.

Hon. Auditor: Mr. E. J. Exley.

Council: Under the Rules Dr. J. B. Hamilton and Mr. G. C. Israel retired from the Council and the following members were elected to the Council in their places:—

Professor V. V. Hickman (retiring 1949).
Mr. W. H. Hudspeth (retiring 1949).

Also one member was required to take the place of Mr. L. Cerutty, who was elected Vice-President, and Dr. H. D. Gordon was elected for two years. The names of the full Council for 1946 are given on the previous page.

The Council made the following appointments at its first meeting:—

Assistant Librarian: Miss H. Taylor.
Standing Committee: Mr. H. Allport, Dr. W. L. Crowther, Professor V. V. Hickman, and the Hon. Secretary.

The Council elected the following two members of the Society to serve on the Board of Trustees of the Tasmanian Museum and Botanical Gardens:—Professor V. V. Hickman and Dr. H. D. Gordon.

Nine ordinary meetings and one special meeting were held during the year (see Proceedings for abstracts of papers). In addition, scientific papers were submitted for publication and have been printed in the 1946 (present) volume.

Library

During the year 326 volumes were added to the Library in addition to a number of reports and pamphlets from British and foreign institutions and learned societies. The number of institutions on the Exchange List for the year was 284, and new exchanges were arranged with the following institutions:—Royal Museum of Art and History, Brussels; Service de Documentation, Centre National de la Recherche Scientifique, Paris; and Botanical Institute of the Academy of Sciences, Erevan, Moscow. The Library now consists of 21,385 volumes.

An amount of £57 3s. 3d. was spent on books during the year, and the account allocated as follows:—

	£	s.	d.
General Fund	16	13	0
R. M. Johnston Memorial Fund	16	0	2
Morton Allport Bequest	7	10	0
Clive Lord Memorial Fund	15	12	7
A. H. Clarke Bequest	1	7	6

Clive Lord Memorial Library

Reference has already been made to a valuable gift of 230 books presented to the Library by Mrs. Lord in memory of her late husband, Mr. Clive Lord (see 1944 volume, p. 118). During the year under review, the Council decided that a special Clive Lord Memorial Book Plate should be placed in these books, and this has now been done.

Shelves

During the year the Council purchased new bookshelves to meet the growing demands of the Library. These were provided at a cost of £97 11s. from the Reserve Fund, and have been placed at the Macquarie Street end of the Library.

Membership

The Society consists of the following members:—

		1945		1946
Honorary members		2		2
Corresponding members		2		2
Ordinary members—				
Class A.	164		173	
Class B.	100		114	
Unclassified	14		7	
	—	278	—	294
Life members		9		14
Associate members		14		18
		305		330

During the year 12 names were removed from the list of Members owing to deaths, resignations, etc., and 37 new members were elected, five of these being life members, 27 ordinary members, and five associate members.

Deaths

The Council regrets having to record the deaths of the following members during the year:—Miss D. Baudinet (1929), Miss I. Gunn (1928), and Mr. C. E. Boyes (1944).

Mr. Boyes was the grandson of Mr. G. T. W. Boyes, Colonial Secretary during the Franklin regime. The late Mr. Boyes was a valued supporter of the Society and from time to time presented documents of considerable historic value. Particular mention should be made of the valuable gift of the diary of his grandfather comprising 13 volumes covering the period 1832-1855 (see Papers and Proceedings, 1944, p. 118). These diaries have been studied by Mr. W. H. Hudspeth and have provided him with material for a lecture which was given before the Northern Branch of the Society on 8th October, 1946. This lecture is printed in the present volume (see page 35).

Alteration of Rules

A special meeting of the Society was called on 2nd April, 1946, in order to consider certain alterations to the Rules. Details regarding these alterations are given in the Abstract of Proceedings (see page 131).

Panel Heating

During the year a new system of panel heating was installed in the Society's Room. This was provided at a cost of £206 and was used only during the latter part of the year. The new system promises to solve satisfactorily the difficult problem of heating the room during the winter months.

Meteorological Books

A number of meteorological journals and publications were presented by the Council to the Commonwealth Meteorological Department, Hobart, during the year.

R. M. Johnston Memorial Lecture

During the year the Council decided to have an R. M. Johnston Memorial Lecture. This was held on 5th November, 1946, and Professor L. H. Martin, of the University of Melbourne, was invited to address the Society on the subject of 'Radar'. (See abstract on p. 137.) On that occasion Professor Martin was presented with the R. M. Johnston Memorial Medal. At the conclusion of the meeting Dr. and Mrs. W. L. Crowther entertained members of the Council and their wives, together with the visiting lecturer, to supper at their home.

Preservation of Ancient Buildings and Scenic Reserves

During the year the sub-committee appointed by the Council of the Society continued to function, and met on several occasions. It is the intention of the Council to ask the Minister for Lands and Works to receive a further deputation in order to discuss this subject.

Meeting of Australian and New Zealand Association for the Advancement of Science

A meeting of the Australian and New Zealand Association for the Advancement of Science was held in Adelaide this year after a lapse of seven and a half years. Professor A. Burn, Dr. H. D. Gordon, and the Hon. Secretary (Dr. Joseph Pearson) represented the Society. Dr. Pearson was President of Section D (Zoology) of the Association and the subject of his presidential address was 'some Problems in Marsupial Phylogeny'.

Printing of Index to Papers and Proceedings

The attention of members is drawn to the inclusion in the present number of the second and concluding part of the Index of the Papers and Proceedings for the years 1898-1944 inclusive. The first part of this index was printed in the Papers and Proceedings for 1945.

Gifts to the Society

The following is a list of gifts to the Society during the present year, in addition to the numerous exchanges received from British and foreign institutions:—

Then and Now in Old Westbury, by K. R. von Stieglitz: Presented by the Author.

Letters of Queen Victoria, Vols. 1-3 (1837-61): Presented by Mr. J. D. McElroy.

The Aryan Maori, by Edward Tregear: Presented by Mr. J. D. McElroy.

New Zealand of To-day, by Edward Wakefield: Presented by Mr. J. D. McElroy.

Dictionary of the New Zealand Language, by Wm. Williams: Presented by Mr. J. D. McElroy.

Typee: A Peep at Polynesian Life, by Herman Williams: Presented by Mr. J. D. McElroy.

Polynesian Mythology and Ancient Traditional History, by Sir George Gray: Presented by Mr. J. D. McElroy.

Photographs of Tasmania, by J. W. Beattie: Presented by Miss V. Hunt.

Share Register and Directors' Minute Books, Turkish Bath Coy., 1863-1892: Presented by Mr. G. A. Roberts.

Addresses to H.E. Sir John Stokell Dodds from the Museum and Royal Society, 1901: Presented by Mr. J. D. A. Collier.

List of Relics of Capt. James Kelly housed in the Queen Victoria Museum, Launceston: Presented by Mr. H. W. Wilson.

Document appointing G. T. W. Boyes Colonial Secy., V.D.L., 1842: Presented by Mr. C. E. Boyes.

Various letters from G. T. W. Boyes to his wife, Mary Boyes, 1820-1832: Presented by Mr. C. E. Boyes.

Copy of Franklin Letters to Dr. Turnbull, 1845: Presented by Dr. C. Craig.

Copy of Arthur Letters to Dr. Turnbull, 1839: Presented by Dr. C. Craig.

Milligan Bequest

During the year the Society sold a one-acre block of land at Bicheno which had been left to the Society by Joseph Milligan, a former Secretary of the Society, in his will dated 3rd November, 1883. The block was sold for £150 and this sum has been used to purchase Commonwealth Bonds to that value.

There still remains of this bequest three acres of land at Georgetown, and this is still held by the Society.

Printing of Papers and Proceedings

Once again the Government has very generously contributed a sum of £200 towards the printing of the Papers and Proceedings. The Council wishes to record its appreciation of this assistance.

THE ROYAL SOCIETY OF TASMANIA.

GENERAL FUND.

Statement of Receipts and Payments for year ending 31st December, 1946.

RECEIPTS.					£	s.	d.
Balance from last Account					27	9	6
Membership Fees—							
A	172 =	258	9	6			
B	107 =	112	7	0			
Associate	17 =	8	10	0			
Life Members	6 =	90	0	0			
					469	6	6
Rental, sales, &c.					62	19	9
Sale of land at Bicheno, Milligan Bequest					146	17	4
Transferred from Memorial Funds for books—							
1945—							
R. M. Johnston Memorial		17	5	7			
Morton Allport Fund		3	5	0			
A. H. Clarke Bequest		0	18	11			
Clive Lord Memorial		4	10	0			
					25	19	6
1946—							
R. M. Johnston Memorial		16	0	2			
Morton Allport Fund		7	10	0			
A. H. Clarke Bequest		1	7	6			
Clive Lord Memorial		15	12	7			
					40	10	3
					£773	2	9

PAYMENTS.				£	s.	d.
Salaries				156	17	0
Group Insurance				2	4	0
Petty Cash				40	1	0
Fuel and Light				24	0	5
Library				80	9	6
R. M. Johnston Memorial Lecture, expenses				11	0	0
Miscellaneous				80	12	8
Postage of Papers and Proceedings				27	7	10
Stationery, Printing and Advertising				34	9	8
Insurance				9	12	7
Northern Branch, share subscriptions				10	13	0
Milligan Bequest (Commonwealth Loan)				150	0	0
Reserve Fund—						
Six Life Memberships	90	0	0			
Transferred from General Fund	50	0	0			
				140	0	0
				767	7	8
Balance to next Account				5	15	1
				£773	2	9

S. ANGEL, Hon. Treasurer.

H. J. EXLEY, Hon. Auditor.

HENRY ALLPORT, Vice-President.

JOSEPH PEARSON, Hon. Secretary.

Balances in Royal Society Funds, 1946.

	£	s.	d.
Reserve Fund	122	4	4
Life Membership Fees	163	15	6
Clive Lord Memorial Fund (£200)	29	1	8
R. M. Johnston Memorial Fund (£232)	2	0	6
Morton Allport Memorial Fund (£200)	0	10	0
A. H. Clarke Bequest (£100)	2	3	10
Milligan Bequest (£150)	Nil		

Abstracts of Proceedings

5TH MARCH, 1946

Annual Meeting

The Annual Meeting was held in the Society's Room, Tasmanian Museum. Professor V. V. Hickman, Vice-President, presided.

The following were elected Office-bearers and members of the Council for 1946:—Mr. L. Cerutty was elected Vice-President in the place of Professor V. V. Hickman, who retires under Rule 12; Professor V. V. Hickman and Mr. W. H. Hudspeth were elected in the places of Dr. J. B. Hamilton and Mr. G. C. Israel, who retire under Rule 21; Dr. H. D. Gordon was elected to take the place of Mr. L. Cerutty, who was elected Vice-President; Hon. Treasurer, Mr. S. Angel; Hon. Auditor, Mr. H. J. Exley; Hon. Secretary, Dr. J. Pearson; Assistant Hon. Secretary, Mr. D. C. Pearse.

Mr. M. Bower was elected a member of the Society.

Mr. W. H. Hudspeth delivered an illustrated lecture entitled 'The Stones of Hobart'.

2ND APRIL, 1946

A special meeting was held in the Society's Room. Mr. Henry Allport, Vice-President, presided.

Rule 44 was amended to read as follows:—

> Ordinary and life members shall have the right to vote for Office-bearers and Council, to attend all meetings of the Society, and to take part, subject to the control of the Chairman of such meeting, in the business of such meetings, to use the Library and books of the Society, subject to any rules which the Council may make regulating the Library and its use. Each Ordinary Member who, under Rule 33, is entitled to receive the Papers and Proceedings, shall receive one copy for every year during which his subscription has been duly paid.

The following new rules were passed:—

> 1. That all papers published in the Society's Papers and Proceedings should be deemed to be the property of the Society.
>
> 2. That in the case of all papers read before the Society but not printed in the Papers and Proceedings a copy of the manuscript should be placed in the Society's Library for permanent record.

2ND APRIL, 1946

A meeting was held in the Society's Room. Mr. Henry Allport, Vice-President presided.

The following were elected members of the Society:—Ordinary Members: Miss Joi Chapman, The Lord Bishop of Tasmania, Mr. J. C. Bennett, Mr. H. A. Buchdahl, Mr. D. A. Davie, Dr. R. W. Lawrence, Mr. W. N. Oats; Associate Member: Mr. W. B. Hitchcock.

Mr. L. W. Miller delivered an illustrated lecture entitled 'The Nutritional Requirements of Insects', of which the following is an abstract:—

Until recently the subject of insect nutrition had been a neglected branch of the science of entomology. The recent war and the importance of food storage necessitated intensive studies being made into the food habits and nutritional requirements of many of the pests of stored foods.

Because of the wide diversity of foods that are eaten by insects, one finds a high degree of specialisation in the food habits of the various species. Research has shown, however, that despite this superficial complexity, the fundamental nutritional requirements of the various species are surprisingly uniform. They may, however, be satisfied in different ways from widely differing sources.

Insects, like other living organisms, must somehow obtain energy, carbon and nitrogen, and the mineral elements necessary for the functioning of protoplasm. The sources of carbon and nitrogen must be as organic compounds as insects are quite incapable of satisfying their nutritional requirements with simple inorganic salts.

The importance of fats and the various mineral elements in insect nutrition is still imperfectly understood. In recent years it has been shown that vitamins are also essential in insect nutrition. The present knowledge of the vitamin requirements of insects suggests that they require only members of the "B Group" vitamins. Sometimes, however, the vitamin requirements of the insect may be satisfied by intra-cellular symbionts, which apparently have the power of synthesising some or all of the "B Group" vitamins.

7TH MAY, 1946

A meeting was held in the Society's Room. Mr. Henry Allport, Vice-President, presided.

The following were elected members of the Society:—Ordinary Members: Mrs. E. M. Cuthbert, Miss Katie Helms, Mrs. A. N. Lewis, Dr. Thomas Giblin, Mr. J. N. D. Harrison, Mr. M. L. Hughes, Mr. N. R. Laird, Major J. W. C. Wyett; Associate Members: Miss Margaret Hope, Mr. E. R. Taylor, Mr. Bernard B. Walker.

A paper entitled 'The Military History of Tasmania', prepared by Brigadier O. V. Hoad, was read by Mr. W. H. Hudspeth. The following is an abstract:—

Tasmania has associations with the British Army dating back for 142 years.

The army played an important part in building up the British Empire and a number of Imperial regiments served in Tasmania and other parts of Australasia.

Lt. John Hayes of the Royal Indian Navy brought an expedition to Tasmanian waters in April 1793, when he named the River Derwent and also gave the name Risdon to the place where the first settlement was established Lt. John Bowen, R.N., arrived at Risdon on 12th September, 1803, to form the first settlement there Lt. Colonel David Collins landed at Risdon on 16th February, 1804 and was received by a Guard of Honour formed by members of the New South Wales Corps under Lt Moore, who was acting Commandant at the time, Lt. Bowden having gone to report to the Governor in Sydney. Lt. Edward Lord, R.M., built the first private house on or near the site where Macquarie House now stands in Macquarie St.

In July 1804, the military garrison consisted of a Lt. Colonel, two first lieutenants, one second lieutenant, three sergeants, three corporals, two drummers and 37 privates. The first garrison in Northern Tasmania consisted of a detachment of the New South Wales Corps under Lt. Colonel William Paterson, they arrived at the Outer Cove near George Town in November 1804. Until 1812 this northern settlement and that at Hobart Town were administered as separate commands, each having a Lieut. Governor, who was also the senior military officer. An interesting fact relating to Lt. Colonel Collins' garrison is that it was responsible for the first wedding in Tasmania. This was the wedding of Corporal W. Gengell and Mrs. Anne Skilhorne, a widow at Government House, on 18th March, 1804.

The duties of the military forces in the early days were many and varied. They had to keep order, protect the inhabitants from aboriginals and bushrangers, hunt down escapees, guard prisoners and supervise road building and other public works. The opening up of new areas brought fresh responsibilities to the army. In 1824 there were 230 troopers in Tasmania, detachments being at George Town, Launceston, Macquarie Harbour, Jericho, New Norfolk, Ross and twenty-five men were held in reserve for the pursuit of bushrangers.

From 1870, when the last British regiment left Tasmania, until Federation, Volunteer regiments constituted the main military forces in the island.

The first Tasmanian contingent to go abroad was one company raised in October, 1899 with a strength of four officers, one W.O., five sergeants, four corporals, two buglers and sixty-four privates. Since then several Tasmanian contingents have seen service overseas, winning for themselves high praise, and many decorations.

A paper entitled 'Huts of Tasmanian Aborigines', prepared by Mr. J. F. Jones, was read by Mr. A. L. Meston. The following is an abstract:—

On that part of the west coast that lies between Mt Cameron West and the Pieman River, circular artificial hollows about four feet deep and of varying diameters occur in small groups. Such hollows are found only on well-drained spots from which a good outlook can be obtained, and from the evidence gained by excavating them, they are all that remain of native huts such as were seen and described by Robinson, Jorgensen and others. If one of these circular depressions is dug there is first a foot or so of clean drift sand, then appears a layer of blackened sand mixed with charcoal, shells, bones, native flaked instruments and cores from which the flakes were struck. In addition there are usually a few long fire-blackened stones that evidently enclosed the fire. Lower still the sand again becomes clean and shows no sign of having been previously disturbed

Of one hut that he saw Jorgensen writes, 'It was a complete piece of Gothic Architecture in the shape of a dome and presenting all the first rudiments of that science It was made to contain 12 to 14 people with ease. The entrance was small and not above two feet high. The wood used for the principal supports had been steamed and bent by fire.'

When on a visit in 1945 to Bluff Hill Point, in close proximity to the site of the hut praised by Jorgensen, Mr Jones noticed standing erect at the edge of one of the hut depressions a portion of a rib of a large whale. On pulling it out of the sand, he found it to be but a fragment two feet long, the upper portion from exposure to the air having decayed. The end that had been forced into the ground had been cut to a point on two sides by the chopper of a native. Near by he found a complete rib, from its size apparently of the same whale, but little decayed having probably been only recently uncovered.

Upon reflection he considered that in one at least of the huts a whale's ribs had been used for the supports, and he realised how Jorgensen's Gothic vault and dome were quite comprehensible A number of ribs with one end buried in the sand at intervals around the hollow, and with their other ends gathered and fastened together over the middle of the hut, would, when completed with lighter material and thatched make a very perfect dome. Inside in the dim light, and blackened by smoke, the bones might easily be mistaken for wood, while their smoothness and the evenness of the curves would give the impression of timber that had been artificially shaped

Good thatching material exists in the vicinity Large tufts of coarse tough grass about six feet high with smooth flat blades an inch or more in width are very plentiful in sheltered spots among the bushes which it makes quite impenetrable

Mr. Meston exhibited some knobbed implements made from trees by the Aborigines and sent by Mr. James, Head Teacher of the Marrawah State School.

4TH JUNE, 1946

A meeting was held in the Society's Room. The President, His Excellency the Governor, presided.

The following were elected members of the Society:—Ordinary Members: Mrs. G. Cox, Mr. R. F. Davidson, Mr. M. C. Neuburger; Associate Member: Miss P. W. Richardson.

Mr. J. M. Gilbert delivered an illustrated lecture entitled 'Forest Fire Control', of which the following is an abstract:—

Fire damage must be kept to a minimum if forest benefits are to be obtained in full and sustained amounts Fires affect the growth and composition of stands and in a few cases can be used as a beneficial sylviculturne tool Indiscriminate burning adversely affects watersheds and wild life.

Fire prevention activities include education, legislation and the removal of hazards Pre-suppression work includes the erection of look-out towers, the provision of communications, access, transport, equipment and water storage and the training of fire crews.

There are three main principles to be observed in forest fire suppression:—

(1) Make a reconnaisance before the starting

(2) Tackle the head fire as soon as possible.

(3) When the spread is checked, the fire should be mopped-up and patrolled

Fire control planning includes investigation of fire causes and classes of people responsible, into the effectiveness of pre-suppression measures and fire-weather forecasting.

An annual suppression plan should be prepared for each district.

The question of the amount that can be afforded for forest fire protection has not been satisfactorily answered.

2ND JULY, 1946

A meeting was held in the Society's Room. Mr. L. Cerutty, Vice-President, presided.

The following were elected members of the Society:—Mrs. G. E. Perrin, Miss Ruth White, Mr. A. M. Olsen.

Dr. J. Pearson exhibited the following:—

(*a*) A sub-fossil tooth of the Sperm Whale *(Physeter catodon)*, from Flinders Island.

(*b*) Osteological remains of the False Killer Whale *(Pseudorca crassidens)*, found near Eddystone Lighthouse.

(*c*) Osteological remains of the Strap-toothed Whale *(Mesoplodon grayi)*, from Eaglehawk Neck.

Mr. G. T. J. Wilson delivered a lecture entitled 'Local Government and Democracy'.

6TH AUGUST, 1946

A meeting was held in the Society's Room. The President, His Excellency the Governor, presided.

Miss Ann Fraser and Mr. A. P. Findlay were elected members of the Society.

Dr. Joseph Pearson delivered an illustrated lecture entitled 'The Evolution of the Mammalian Placenta', of which the following is an abstract:—

The term *placenta* should be applied to those structures which assist in bringing about an intimate apposition or fusion of the trophoblast and associated parts of the foetus with the uterine wall for the purpose of carrying out physiological processes necessary for the well-being of the foetus

The accompanying figure embodies all embryonic structures which take part in placental formation but which are not necessarily found in the same embryo at the same time

The following foetal structures may become apposed to the uterine epithelium or uterine wall to form a placenta:—

1. *Chorion* (*Ch.*)

Consists of the extra-embryonic ectoderm or trophoblast (Tr) and somatic mesoderm (S.M.). This is the simplest type and is non-vascular. The 'uterine milk' is absorbed through it. Probably functions in monotremes and for a short period in marsupials and eutherians *(Chorionic Placenta.)*

2. *Bilaminar omphalopleure* (Bi. Om.)

Consists of the trophoblast and the yolk-sac endoderm (Ys.E.). Non-vascular. Present in many marsupials throughout the foetal period and probably functions for a brief stage in some eutherians. *(Bilaminar Vitelline Placenta,* or *Non-vascular Yolk-sac Placenta.)*

3 *Vascular omphalopleure* or *chorio-vitelline membrane* (V.Om.)

Consists of trophoblast, somatic mesoderm, splanchnic mesoderm (Sp.M.) and yolk-sac endoderm. Vascular. The functional placenta of most marsupials, and functional for a short time in the early stages of *Perameles* and many eutherians. *(Chorio-vitelline Placenta* or *Vascular Yolk-sac Placenta.)*

4. *Allantochorion* or *Chorio-allantoic membrane* (Al.Ch.)

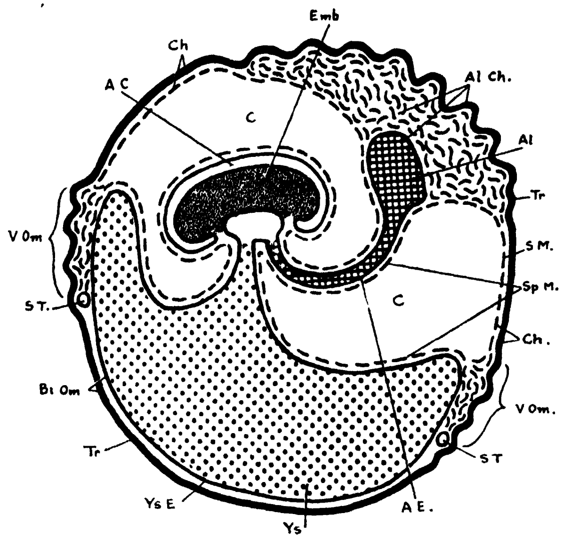
Formed normally when the allantoic endoderm (A.E.) with its investing layer of splanchnic mesoderm reaches the chorion. This is the 'true' or allantoic placenta, characteristic of *Perameles* and all eutherians. *(Chorio-allantoic Placenta.)*

In the most primitive type of chorio-allantoic placenta, the *epitheliochorial*, the two blood streams are separated by six sets of tissues:—

Foetal. Endothelium of the foetal blood vessels, mesoderm, and trophoblast.

Maternal. Uterine epithelium, connective tissue, and endothelium of the maternal blood vessels.

In the more modified types of placenta the trophoblast attacks first the uterine epithelium and later the other two maternal components until in the most highly specialized and efficient type, the *haemoendothelial*, the extravasated maternal blood surrounds the foetal blood vessels so that interchanges between maternal and foetal blood streams are effected across the simple membrane which constitutes the wall of each foetal blood vessel.



Embryonic structures which may contribute to Mammalian Placentation (The maternal components of the placenta are not shown.)

A C. amniotic cavity, *A E* allantoic endoderm, *Al* allantois, *Al Ch* allanto-chorion, *Bi.Om.* bilaminar omphalopleure, *C.* extra-embryonic coelom (splanchnocoele), *Ch* chorion, *Emb.* embryo, *S M.* somatic mesoderm, *Sp.M.* splanchnic mesoderm, *S T* sinus terminalis, *Tr* trophoblast, *V.Om.* vascular omphalopleure, *Ys.* yolk-sac, *Ys.E* yolk-sac endoderm

The fundamental embryonic elements in a vascular placenta are (1) the trophoblast with its phagocytic effect upon the uterine tissues and (2) the splanchnic mesoderm which bears the placental bloodvessels of the foetus

In the Marsupialia the following placental conditions are found:—

Type 1

Allantois does not reach the chorion.

Bilaminar vitelline placenta sometimes functional.

Chorio-vitelline placenta generally well-developed (*Didelphis*, some phalangers, rat-kangaroos and kangaroos).

Type 2

Allantois reaches the chorion but does not form a placenta Later retreats from the chorion and takes up a position as in Type 1.

Bilaminar vitelline placenta, probably nutritive.

Chorio-vitelline placenta probably respiratory. (*Dasyurus*)

Type 3

Allantois reaches the chorion and remains there but is not placental, probably respiratory.

Both types of vitelline placenta function, probably nutritive. (*Phascolarctos*, *Halmaturus.*)

Type 4

Allantois reaches the chorion and forms a functional chorio-allantoic placenta.

Chorio-vitelline placenta functional in early stages (*Perameles.*)

It is usually considered that Type 4 is the most primitive and that gradual retrogression from a functional chorio-allantoic placenta is shown in Types 3 2 and 1, with Type 1 exhibiting the greatest degree of degeneration. It is also widely accepted that the common ancestors of the marsupials (Methatheria) and 'placental mammals' (Eutheria) had a chorio-allantoic placenta

and that all marsupials except the perameloids have lost their true placenta and have fallen back upon the inefficient vitelline placenta. One of the purposes of the present lecture was to call in question these accepted views and to show cause why the sequence as given above, with *Perameles* as the last and most specialized of the series, probably depicts more correctly the course of placental evolution in the marsupials.

It was claimed that a good case could be presented for considering the common ancestors of the Metatheria and Eutheria as having lacked a chorio-allantoic placenta, and that the perameloid type of placenta had arisen by convergence. The absence of a chorio-allantoic placenta in nearly all recent marsupials might be due to their having arisen from non-placental stock.

The various types of placentation in eutherian mammals were then considered. It was shown that in the early stages of foetal development of all viviparous mammals the yolk-sac is relatively large and may for some time have placental functions. In marsupials the yolk-sac retains its importance and has placental functions and the allantois is small and usually non-placental. It was suggested, therefore, that the Proplacentalia possessed a vitelline placenta and that when the marsupials and eutherians diverged from this common stock the former retained the ancestral characteristic, while in the latter group the yolk-sac gradually lost its importance and was ultimately superseded as a placental organ by the allantois.

Some investigators claim that the placenta provides a reliable criterion of mammalian inter-relationships, but this view is open to question. It was pointed out that recent researches in reptilian placentation have revealed that in this group at any rate the type of placentation did not necessarily give an indication of affinity.

3RD SEPTEMBER, 1946

A meeting was held in the Society's Room. Mr. H. Allport, Vice-President, presided.

The following were elected members of the Society:—Mr. Gollan Lewis, Mr. R. A. McInnes.

The Assistant Honorary Secretary drew the attention of members to the Geographical Journal, Vol. CVI, Nos. 5, 6: Nov.-Dec. 1945, in which there is a paper dealing with the sailing of Sir John Franklin with the 'Erebus' and 'Terror'.

Mr. W. T. Dowsett delivered a lecture entitled '"Ordinary People" in the First Settlements' of which the following is an abstract:—

The purpose of the paper was to demonstrate the use of the atomistic method of historical study as a supplement to the usual approaches through the development of States resting upon Austinian monism or by the pluralist examination of the interplay between movements and institutions That is to say, the paper was concerned only with the views of historical events seen through the eyes of ordinary people of the times.

Two justifications of the method were given, the first based upon a normative historical philosophy. It suggested that any social science is concerned with the interplay between man and environment, the selected norm being capacity for survival. History regarded thus is concerned with institutional environment and its effects upon man; and since generally speaking, history is made by movements and influenced by great men, but suffered by little men, the little man's reactions to his times are of vital importance.

The method is justified, even for those who do not accept the normative approach, because it can be used to reinforce other studies of positive pluralist history. The source material for research into past movements and associations is largely composed of the writings of those who played leading parts in determining them; it may therefore be coloured by their philosophy. A correction to this is the study of the lives of ordinary people who endured more or less passively the influence of those associations.

One of the few well-known examples of this method is 'Mediaeval People', by the late Professor Eileen Power The paper presented three similar studies, taken from early Australian history, given principally by the Historical Records of Australia. The life of Edwin Dodd, one-time valet to Phillip and manager of the Parramatta community farm, illustrates conditions during the few years of autocratic communism at the beginning of Port Jackson. Richard Clark, soldier and stonemason, experienced the difficulties of settlement in the first days of Van Diemen's Land. Finally, the story of Edward Eagar, emancipist, casts light not only on the changing balance of social classes in New South Wales during the second decade of the nineteenth century, but also on the rise and growth of such institutions of the growing capitalism in the State as Macquarie's Bank and the forms of internal and foreign trade.

1ST OCTOBER, 1946

A meeting was held in the Society's Room. Mr. H. Allport, Vice-President, presided.

The attention of members was drawn to the new Panel Heating system in the Royal Society's Room.

The following were elected members of the Society:—Mr. R. W. Hortle, Mr. C. W. Kent, Rev. L. O. C. White.

Mr. L. Cerutty delivered a lecture entitled 'Robert Boyle, Chemist, and His Times'.

The Reverend Walter Walters exhibited a book written by Robert Boyle on 'The Usefulness of Natural Philosophy', which has been in the Bothwell Public Library since 1839.

5TH NOVEMBER, 1946

A meeting was held in the Society's Room on the occasion of the R. M. Johnston Memorial Lecture. It was advertised as a public meeting and invitations were also extended to members of the member Societies of the Tasmanian Association of Scientific Societies.

Approximately 200 people were present.

Mr. L. Cerutty, Vice-President, presided.

The following were elected members of the Society:—Mr. H. K. Aves, Mr. W. F. Walker, Mr. G. H. Willing.

The following papers which had been submitted for publication in the Society's Journal were tabled, and it was agreed to submit them to the Standing Committee:—

Note on a new Cestode from the Tasmanian 'Electric Ray' (*Narcine tasmaniensis* Richardson). By P. W. Crowcroft. (See page 1.)

Some digenetic Trematodes from Fishes of Shallow Tasmanian Waters. By P. W. Crowcroft. (See page 5.)

The female urogenital system of the Bandicoots *(Peramelidae)*. By Joseph Pearson.

The development of the urogenital system in the Marsupialia. By Joseph Pearson.

The Chairman presented the R. M. Johnston Memorial Medal to Professor L. H. Martin, who then delivered an illustrated lecture on 'Radar', as follows:—

Introduction

Two outstanding contributions were made by the physicists of the United States during the War—*Radar* and the *Atomic Bomb*. It may be that History will confirm the opinion expressed by Professor Blackett that the atomic bomb did little to win the war and has since served only to bedevil the Peace, but of Radar there can be no division of opinion. In its many modifications and adaptations Radar did more than any single technical device to bring defeat to the enemy.

The story of Radar mirrors in a striking fashion the development of the struggle against the forces of Germany by the British Empire. In its original conception as a defensive weapon, it played a decisive part in winning the Battle for Britain. Later, coupled with the mounting air strength of the United Nations it evolved into an offensive weapon which slowly drained the vitality of German industrial power. Radar brought defeat to the U-boat in the Battle for London, and paved the way for success on D-day by assuring precision bombing of German defences through solid overcast. As a measure of the military significance of Radar, it might be mentioned that by July 1945 nearly $3,000,000,000 worth of equipment had been delivered to the U.S. Forces and no doubt a like sum had been expended by Britain

Basic Principles of Radar

Officially the term Radar is said to derive from the descriptive phrase 'radio-detection and ranging'. This definition omits a third aspect of the technique which is equally important, namely 'direction finding'. In this regard the original British term 'Radiolocation' was more satisfactory.

The principles upon which Radar operates are not new; they were demonstrated by Hertz in 1886 when he discovered that radio waves possess the optical properties of visible light.

1. *Radio-Detection*

If a beam of radio waves is directed towards a solid body, a small fraction of the energy will be scattered or reflected back towards the transmitter and may be detected with a sensitive radio receiver. Usually the receiver is operated at the limit of its sensitivity; for example, in detecting a medium bomber at 150 miles the power entering the receiver is less than $1/10^{18}$ of the power radiated by the transmitter.

Radio detection is analogous to the detection of a plane with a searchlight but possesses essential advantages. The range of Radar is greater than that of the eye, and its ability to detect the target is relatively unaffected by night, fog, smoke, or rain. One of the most potent factors in warfare is surprise, but the element of surprise formerly afforded by darkness, fog, cloud or artificial smoke or simply the glare of the rising sun does not exist in a Radar war. At one time naval battles were described by the factor of who happened to be 'up-sun' from the enemy. The successful action at Cape Matapan by the Mediterranean Fleet took place in pitch darkness at ranges so great that the Italian Fleet had no idea that our ships were in the vicinity. The Scharnhorst was crippled by our heavy guns long before she was in sight.

2 *Ranging*

Ranging by radio makes use of the fact that radio waves travel with the velocity of light, 186,000 miles a second. The technique of 'pulse-ranging' was first used in 1925 by Breit and Tuve of the Carnegie Institute of Washington for measuring the altitude of the ionosphere. A transmitter and receiver are located at the same place, usually sharing a common aerial, and the transmitter is designed to radiate energy in very intense bursts of short duration called 'pulses'. The duration of each pulse may be one-millionth of a second, and each pulse is separated by an interval of a few thousands of a second. During those periods in which the transmitter is silent the receiver detects the echoes of the transmitted pulse scattered back from the target. The time interval between the transmission of a pulse and the reception of its echo is a measure of the distance of the target from the receiver for in this interval the pulse travels with the speed of light to the target and back. Thus if the target is one mile away, the pulse makes the double journey of two miles taking 10·7 microseconds. In spite of the technical difficulties, methods for measuring short intervals of the order of microseconds have been so far improved during the war that the range accuracy in gun laying is now 5 to 10 yards, which corresponds to about 1/30 of a microsecond. Time intervals in Radar are measured with a cathode ray oscillograph. A stream of electrons is made to fall on a screen of fluorescent material such as zinc sulphide and at the point of impact produces a bright spot. This can be swept across the screen with a uniform speed by applying across the X axis plates a uniformly changing potential such as can be obtained by charging or discharging a condenser through a pentode valve. These electrical elements can be chosen to give an appropriate range scale, for example with a long range early-warning Radar the scale may be marked off into divisions of 107 microseconds each of which represents 10 miles of range. For equipment designed to give more accurate ranges at close quarters the scale may be graduated into divisions of 6·1 microseconds, each of which represents 1000 yds of range. The number of journeys of the spot per second is equal to the number of pulses per second and may vary between 100 and 1000. Owing to the persistence of vision the observer sees a bright line on the screen interrupted by a 'blip' corresponding to the range of the target.

3. *Direction-finding*

In most Radar applications directional antennae are used to determine the azimuth and elevation of the target and to concentrate the energy in the desired direction. Accuracy in direction-finding is determined in large measure by the beam width which is given by the formula $W^\circ = 2{\cdot}1 \left(\frac{\lambda \text{ cm}}{D \text{ ft}}\right)$ where λ is the wavelength of the radio waves and D is the effective width of the antenna. In the early days of the war λ was usually 150 cm. and D of the order of 20 ft., in the closing days, λ was 1·5 cm. and D approximately 2 ft., giving a ten-fold improvement in resolution. It is interesting to compare the performance of sound detectors used in the 1914-18 War and the early days of the last War with direction-finding Radar. Consider an aeroplane 10 miles away which is approaching at 300 miles an hour—it will have travelled 4 miles in the

time taken for the sound to reach the observer. The time taken for a radio pulse to reach the plane and return to the receiver is 107 microseconds—in this time the plane will have moved about one-half of one inch. The advantage of Radar to the anti-aircraft gunner is obvious

Radar in Operations

During the winter of 1934-35 the British Air Ministry set up a Committee for the Scientific Survey of Air Defence with Sir Henry Tizard as chairman Sir Robert Watson-Watt, then the head of the National Physical Laboratory Radio Department, suggested the pulse method of Breit and Tuve for the detection of aircraft, and the first experimental system was set up in the late spring of 1935 at Baudsey near the east coast. It is reported that Churchill, on witnessing the first successful tests exclaimed 'England is once again an island'. Work began in 1936 toward setting up five early warning stations about 25 miles apart to protect the Thames estuary. By March 1938 all these stations the nucleus of the great chain which ultimately stretched along the east coats—were complete and operating under R.A.F. personnel. These early warning sets were mounted on huge masts, and ultimately had a warning range of nearly 200 miles. The structures supporting the aerials afforded an unmistakable target, but in the critical early days for some reason were never attacked by the Germans, neither did they attempt to avoid the radio beam by flying in low. The assaults on England by the Luftwaffe began on 8 August 1940 and were initially directed at R.A.F. and Navy bases, but a month later mass raids on London began. Despite a critical shortage of first line fighter planes and pilots (the number of planes has been given as 500), Radar early warning enabled the British to spot each incoming raid in time to throw fighters against it Under favourable conditions Radar actually disclosed German planes assembling on the French coast prior to a raid During August the total loss of German planes was 957 and in the great September battles the Nazis lost nearly 200 of every 500 planes which attacked By the beginning of November the Germans replaced day raids by night attacks

The British had foreseen the danger of indiscriminate night raiding and had striven to develop methods to combat them As far back as 1938 experimental equipment had been developed for use by night fighters to enable them to detect hostile aircraft (Aerial Interception equipment). The night fighters were also given considerable assistance from the ground by S.L C ('Elsie', searchlight control) which searched for and found the enemy plane by Radar before the arc was switched on Experience showed that the target was illuminated 9 times out of 10 In spite of successes a serious situation was not really brought under control until a technique of fighter direction from the ground was built up. This was called G C.I.—ground controlled interception A controller on the ground watched the air situation on the screen of a Radar set which could be rotated to cover the visible horizon He chose a specific target and gave instructions through a V.H.F. communications system to the fighter under his control and manouevred the fighter to a position 1 to 3 miles behind the target, just below and on the same course He then instructed the fighter to 'flash his weapon' and the A I on the plane took over. This was operated by a special Radar operator in the plane who had no other duties than to direct the pilot up to the moment when they were able to see the enemy plane against the night sky. From this time on the pilot completed the attack.

It will be remembered that the width of the Radar searching beam is given by the expression $W = 2{\cdot}1\ (\lambda\ D)$ The shortcomings of early airborne sets was due to the fact that with the shortest wavelength available (1·5 m) and an aerial of the maximum dimensions which could be mounted on a plane the width of the beam was still too great to give precise direction-finding. Accordingly a research group at the University of Birmingham under the direction of Professor Oliphant was given the task of inventing a valve which would generate radio waves some centimetres in length with adequate power. This was achieved by Randall & Boot with their invention of the 'cavity' magnetron, a device which revolutionised the performance of Radar and placed the Radar techniques of the United Nations far ahead of those of the enemy.

Centimetre Radar

One of the first applications of the 10 cm magnetron was the development by ADRDE at Malvern of an accurate gun laying equipment for anti-aircraft fire The tiny dipole was mounted at the focus of a 6 ft. paraboloid and this gave a sufficiently narrow beam (4°) to obtain an average accuracy of 6 min. in angle measurements.

The British G.L III equipment was robust and accurate. In service trials over rough ground the gun carriage of the A.A. gun was cracked but the G L III was operating within a few minutes. Radar-controlled A.A. scored its most striking victory against the V1 buzz bombs. There was a great balloon barrage across the Downs which entangled some of the V1's in its web of steel cables. Radar plotted the paths of the bombs and disclosed many of the launching sites to Allied bombers G.C.I. controlled jet planes also accounted for vast numbers, but it was clear from the first cloudy day that if buzz bombs were to be dealt with it was A.A fire which would have to solve the problem. This A.A., coupled with the proximity fuse, did in large

measure. On a Sunday late in August 105 V1's crossed the British coast headed for London—only 3 of them arrived. Some teams brought down one buzz bomb for every 40 rounds fired. At the end the A.A. was shooting down the great bulk of the bombs and doing just as well on cloudy as on clear days.

For coastal batteries both 3 and 10 cm. waves have been used. It is possible to follow on the screen the path of the shell on its way to the target and if a miss is scored the correction to aim can be made by observing on the screen the distance between the target and the splash. Similar systems are used on ships for gun laying. Ship defence against air attack is interesting. Radar equipped gun directors are trained on the incoming planes. They feed range, altitude, and bearing, into predictors which take into account the target speed, the ship's motion, &c., and position the guns correctly to hurl their shells into the exact spot where the plane will be when the shells arrive. In this way guns of different calibre form screens at different distances corresponding to their range.

From the beginning of the war, the Germans had decided to put a major effort into the destruction of allied shipping by concentrated U-boat warfare, knowing that a German victory depended ultimately on their achieving control of the seas. More than other phases of the conflict the Battle of the Atlantic was a technical conflict, and it did not look always as if the submarine would be beaten. During 1942 Allied shipping was being sunk at the rate of 16,000 tons a day. There were three basic methods of fighting the U-boats:—

1. To attack by bombing the factories which make submarines and the repair shops which maintain the submarines between voyages. The Germans beat this attack by thick layers of concrete;
2. To watch continually the lanes of egress and the areas of operation of the submarines and to search for surfaced submarines; and
3. By employing the convoy system.

In the last war the submarine proceeded submerged during the day and came to the surface at night to charge its batteries. This was no longer possible with Radar-equipped planes which could detect a surfaced submarine tens of miles away.

The Germans ultimately suspected Radar, and this was confirmed in the spring of 1942 when they captured intact one of the A.S.V. Radar sets used by Coastal Command. The Germans countered by equipping each submarine with a receiver which covered the wavelength range used by the A.S.V. Radar. This receiver gave a signal whenever the beam from the airborne Radar swept over the submarine and sufficiently early to permit the U-boat to submerge and escape attack. By the end of summer it was clear to the Allies what was going on. While the number of visual sightings changed very little, the number of Radar sightings declined steadily and the number of blips which disappeared while the plane approached the target told the story.

The British were ready with their next weapon—centimetre A.S.V. The U-boat activities increased markedly during the winter of 1942-43 but by spring a number of 10 cm. A.S.V. sets were in operational use. During May, June and July of 1943 nearly 100 confirmed submarine kills were made, two-thirds of them by aircraft. The German technicians redesigned their receiver several times, painted the U-boats with a special paint in case the Allies were using infra-red detection devices, but still the losses mounted. Two scientific expeditions put to sea in U-boats fully equipped to search for the mysterious radiation used by Coastal Command to detect submarines. Civilian experts were carried with complete and modern apparatus. The first boat put to sea from St. Nazaire on Feb. 5 1944 and lived 13 days. The second left Lorient on April 27 and lasted 9 days. It was not until autumn of 1944 that the Germans found a counter by installing an air-tube they called Schnorkel which enabled a U-boat to breathe and to run its Diesels while still remaining submerged. An extraordinary aspect of the whole story is that the German Army had early captured a British air-borne set which revealed the fact that we were using 10 cm. Radar, but the Army had failed to inform the German Navy.

When the R.A.F. Bomber Command undertook the systematic bombing of the industrial centres of Germany they decided to commit their heavy bombers to night operations entirely. In providing navigational aids for their aircraft the British were at a severe disadvantage in comparison with the Germans. While the latter could erect the aerials of their radio-navigational aids on the Channel coast and in the Low Countries only a couple of hundred miles from London, the British were aiming at targets in the heart of Germany 500 to 700 miles away round the curve of the earth. The British radio-navigational methods, known as GEE and OBOE operated from stations far apart on the East coast of England and proved sufficiently accurate for raids on the Ruhr. To guide the pathfinders as far as Berlin, however, a method had to be devised which was not restricted by the curve of the earth. A Radar method was developed known as H_2S—a designation said to have been inherited from an unsuccessful demonstration in its experimental form.

A shovel-shaped reflector confines the radio pulses into a narrow cone which for navigation is rotated about a vertical axis. The aerial is mounted below the plane directed downwards and as it rotates a circular area of the terrain is swept over by the beam. Energy scattered back from

each pulse enters the aerial, is amplified and made to control the brightness of the cathode ray spot. The presentation of the radio echoes on the screen differs from that previously described. In H_2S the trace revolves about a central point about twenty times a minute in synchronism with the rotating aerial. The fluorescent screen is a thin layer of a phosphor which glows for some time after the cathode ray spot has passed. The surface of more or less level ground sends back echoes of moderate strength so that when an aeroplane is passing over it the screen glows faintly all over. The radio rays are reflected from water like light from a mirror and so scatter practically nothing back to the receiver aerial. The concrete buildings of built-up areas, and ships return much stronger echoes and give rise to bright patches on the screen. Circles at various distances from the centre are inscribed on the screen and these show the pilot how far he is from various features of the terrain and the target. The shape of a town and disposition of its main thoroughfares are so clearly painted on the screen that a town can be recognised by comparing it with the shape in a large scale map The Germans went in for camouflage wholeheartedly, even going to the extent of covering up lakes and rivers with floating disguises and to construct dummy towns realistic enough to deceive the human eye. These flimsy structures did not deceive H_2S however, as the reflections from them bear no resemblance whatever to reinforced concrete and brick.

Counter Measures

Successful radio detection devices were developed independently in America, Britain, France and Germany during the 1930's It is likely that Germany, realising that Radar was essentially a defensive method found no place for it in her blitzkrieg plans. Certainly she made no great use of the technique until she herself was under air assault Germany devised an efficient early warning system on the western approaches to Europe and also developed an effective A.A. control but she was always behind the United Nations in novelty of Radar applications

Nevertheless our losses in massed raids over Berlin became so great that the R A F had to resort to counter-measures Cover for large raids was given by airborne jammers and for a diversion a mock raid could be simulated by a single aircraft fitted with a spurious echo generator. This was called, appropriately enough, Moonshine. 'Window' was also used to confuse the German A.A gunners Dropped from aeroplanes in various forms, usually in the guise of aluminium strips one half wavelength long it gave innumerable strong echoes which cluttered up the screens of enemy cathode ray screens. Ultimately the Germans used Window against us but the British A I planes were by then fitted with centimetre Radar which managed to see through Window

The Germans also developed counter-measures against our Radar. The Scharnhorst escaped while the C.D. (coast defence) stations along the east coast were jammed, but she was detected by a single 10 cm. experimental set which, using a much shorter wavelength, was immune. In the Atlantic struggle too she used a variety of devices such as scattering dummy targets over a wide area of the ocean to confuse the ASV aircraft

Radar in Peace-Time

Radar protected the cities of Britain and our convoys. It was instrumental in bringing down innumerable enemy planes and sinking many ships An aspect sometimes lost sight of was the value of the navigational aids it provided in bringing home and safely landing planes in all kinds of weather after operational flights above Germany. It has been reported that in the early years of the war the Germans lost as many planes landing on temporary fields of France at night as were shot down over England

Navigational aids and aircraft control will probably be the greatest peace-time applications of Radar. For example:—

Large ships: Modifications of H_2S.
Small ships: Land-based beacons triggered from ship.
Aircraft: Varieties of triggered beacons, in larger craft possibly H_2S blind-landing devices.

The fundamental advantage of Radar is that it provides information to the pilot through cloud, fog or falling snow. Meteorological applications of Radar are possible using very short wavelengths. At 10 cm. a moderate rain will scatter back sufficient radiation to give a pattern of the extent of the rain, while at 3 cm. very light rain can be detected However, even with 1 25 cm fog particles which make up ordinary cumulus clouds cannot be seen -drops large enough to be considered rain rather than a heavy fog are necessary to give an echo. In the tropics turbulent centres of thunderstorms give a large echo and the possibility exists of guiding planes through gaps in bad weather when the presence of dangerous local storms would make it unsafe to fly unaided.

The biggest influence Radar will have in peace is indirect. Thousands of man-years have gone into the improvement of component design and construction which will accelerate revolutionary technical advances of many kinds, especially radio communication.

Radar techniques are finding their way into atomic physics. Pulse modulation of the cyclotron is used in producing homogeneous beams of neutrons with known velocity. Two hundred 10 cm. Radar machines are being built into a quarter mile long atom smasher which will produce atomic particles with energies of 10^9ev, probably sufficient to disintegrate the fundamental nucleons themselves. The technical potentialities of Radar seem to be limitless but whatever the future of Radar holds it will play no greater role than its part in the saving of Britain. It gave the peoples of the world a second chance for a lasting peace.

Acknowledgment

Many facts quoted are taken from a 'Report on Science at War' issued by the U.S. Office of S.R.O., the War Department and the Navy Department.

Northern Branch Annual Report, 1946

Following the decision to restrict the number of lectures given during the session, there were two very successful gatherings, the first on the occasion of Mr. W. H. Hudspeth's talk on 15 October, 1946, and the second, Mr. A. L. Meston's talk on 26 November, 1946. Both meetings were held at the Museum.

Mr. W. H. Hudspeth delivered a public lecture entitled 'Some Leaves from the Diary of a Van Diemen's Land Official'. His material was based on the diaries of Mr. G. T. W. B. Boyes, Colonial Auditor from 1826-1853. These diaries were the personal comments of Mr. Boyes on the Governors under whom he served, namely Arthur, Franklin, Eardley Wilmot and Denison; and on the people and events of the period. The diaries, hitherto unpublished and unknown, form a valuable commentary on many aspects of the political life of the Colony and contain much new material. The lecture was illustrated by lantern slides.

The Governor, Sir Hugh Binney, presided over the November meeting, which was the first time a meeting of the Branch had been attended by a President of the Society. Mr. A. L. Meston delivered an illustrated lecture on 'The Tasmanians and their Culture'. He dealt first with the history of the contact of the aboriginal with the white man. The aboriginal was then described and related to a negroid stock (unlike the Australian) and his habits and customs, his tools, weapons and utensils described, all aspects of his life and culture being discussed. Mr. Meston drew attention to the many primitive characters shown by the Tasmanian; thus he found their boat to be of a type found very early in the history of man and still to be seen in Abyssinia, on Lake Chad and on Lake Titicaca. The lecture was illustrated by lantern slides.

In addition to these meetings, members of the Branch interested themselves in problems relating to Northern Tasmania, groups being organized to study local history and botany. In the latter case much collecting was carried out, particularly in the Tamar Valley, it being arranged to make the specimens available to Dr. H. D. Gordon for study in connection with his revision of Rodway's 'Tasmanian Flora'.

As a result of the renewed activity of the Branch during the year, eleven new members joined the Society and four members became Life Members.

Officers of the Branch and their terms of office are:—

Chairman: F. Smithies, 1947.

Vice-Chairman: J. E. Heritage, LL.B., 1947, 1948.

Council: C. Craig, M.D., M.S., F.R.A.C.S., 1947, 1948; T. Doe, B.Sc., 1947; J. R. Forward, 1947; Gilbert C. McKinlay, 1947, 1948.

Hon. Secretary-Treasurer: N. J. B. Plomley, M.Sc.

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MISCELLANEOUS

OBITUARY AND BIOGRAPHICAL

PHYSICS, CHEMISTRY, &c.

VERTEBRATE ZOOLOGY

AMPHIBIA

AVES

MAMMALIA

PISCES

REPTILIA

H. H. Pimblett, Government Printer, Tasmania.

PAPERS AND PROCEEDINGS

OF

THE ROYAL SOCIETY OF TASMANIA

FOR THE YEAR

1947

Edited by
JOSEPH PEARSON
and
D. COLBRON PEARSE

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PAP. AND PROC. ROY. SOC. TASMANIA, 1947 (1ST AUGUST, 1948)

Fish Welfare

By

HAROLD THOMPSON

Chief of the Division of Fisheries, C.S.I.R.

(Read 11th November, 1947)

PLATES I-III

SOME GENERAL CONSIDERATIONS

It is proposed in this lecture to make some examination of the responses of fish populations to influences brought to bear upon them in their physical and animate environments. I hope to focus particular attention on the relationship between research findings and fisheries' management and exploitation. Although I shall draw on almost world-wide sources for my examples, most of what is said will, I think, bear application to Tasmanian fisheries. The latter are an important factor in the economy of this sea-girt State and are, it is pleasing to note, at present in a phase of expansion. My remarks will, I trust, show that it is essential to ensure that such expansion must proceed rationally, guided by basic principles now well-established—principles which are in harmony with such as were espoused by the late Mr. Clive Lord, in whose memory this lecture is given, and to whose great work for science in Tasmania so much is due.

In his R. M. Johnston Memorial Lecture delivered to this Society, Professor W. J. Dakin (1934) dealt very fully with the great advances which had been made in fisheries' science in preceding, though comparatively recent, years. More than a decade has passed since this lecture was given, and we have had a second opportunity of witnessing, after a prolonged war period, the results of compulsory restriction on man's fishing efforts. Some apparently fundamental principles, which had required a more prolonged period of testing out, have now become firmly established in this intervening period. I shall therefore endeavour to illustrate, as far as possible from my own direct association with fisheries' research in several widely separated countries, some of these cardinal principles which, to a large extent, govern the welfare of fish stocks.

Great numbers of fish species have been described by taxonomists, each species being recognisable by certain body characters fixed within certain limits—characters such as size, shape, number of vertebrae, number of fins and of finrays, nature of dentition and so forth. Within these limits, as we shall see later, it is sometimes possible to recognise races exhibiting more or less constant minor variations in these characters. Thus it is that experienced fishermen in, say, Newfoundland, pride themselves on being able to say, from superficial examination of a catch of codfish brought to market, from what part of the coast this catch has come. They easily differentiate the round-snouted, plump, fast-growing cod of the Grand Banks from the sharp-snouted, comparatively lean or slinky, slow-growing cod from the deep bays or from Labrador. The general positon is that certain species have become established, in greater or lesser numbers, to suit the conditions in particular environments. Thus we identify the cod as being the characteristic fish of Norway and Newfoundland, just as the barracouta appears to be the most prolific fish in

Tasmanian waters. In general, the rule holds that in the colder waters of high latitudes there are comparatively few fish species—e.g., cod, haddock, herring—but great numbers of each, whereas in tropical and sub-tropical seas there are great numbers of different species but no colossal quantities of any one species. Thus fewer than 100 fish species have been found in Newfoundland waters, whereas over 2000 species have been identified in Australian waters. In the latter, following the same rule, the number of species decreases from about 1900 in Queensland waters to about 700 off New South Wales and still fewer in the colder Tasmanian waters. Nor is it possible to introduce a prolific cold water species to warmer waters—for example, any effort to introduce the ordinary herring of commerce, the most prolific fish in north boreal waters, to Australian waters would almost inevitably fail, owing to the wide difference in temperature conditions between the two areas. It is also highly questionable whether this fish could be introduced to waters of suitable temperature conditions in the Antarctic, since other necessary conditions may well be lacking—for example, suitable sea-floor conditions for the deposition of eggs, and suitable food supplies for the developing and for adult fish themselves. I have myself participated in an experiment designed to effect the transplantation of a fish much esteemed in the Billingsgate Market—the Dover or Black Sole—over a distance of a mere few hundred miles from the East Anglian Coast to the Firth of Forth in Scotland. The effort was a total failure—we transferred several hundred of the soles, each carrying a tag for its identification should it be recaptured, to the Firth. No trace of these tagged soles was ever discovered. It is a fair deduction that the new environment was unsuitable for the soles and that they failed to survive.

In the case of marine fish it appears to be extremely difficult to effect the colonisation of new environments, whereas, of course, it has been found possible to achieve success in introducing certain fresh-water fish such as trout. The degree of success is, however, much less in the case of fish such as the true salmons, which under natural conditions spend a considerable portion of their life at sea.

Effects of Physical Conditions

1. *Effect of Environment on Pigmentation*

The development of protective coloration is well exemplified among fishes, just as it is among terrestrial animals. Pelagic fish, and deep-sea fish which swim in the upper water layers, tend to have dark greenish, reddish-brown, or bluish coloration on the dorsal surface, and to be more or less silvery on the under surface. Thus some protection is afforded from predators, which view their prey against a dark or a light background from above and from below respectively. Many fish have the faculty of rapidly altering their colour pattern to match that of the environment. This has been shown experimentally in the aquarium by placing a Mediterranean flat-fish on a succession of substrates of different patterns. The fish rapidly assumed the patterns in succession to such a degree as to merge into the background and be quite inconspicuous. In the course of an extensive research cruise from Scotland to Iceland, via the Faroe Islands, I have had the opportunity of observing the range of variation in coloration of cod captured in different localities. During that cruise the cod taken varied from the ordinary reddish-brown of the so-called rock cod of the red and brown seaweed zones close inshore, to various darker tints in cod taken in deeper offshore waters, and so on to the yellow biscuit-like colour of cod captured on Faroe Bank, where the substratum consists of yellowish shell fragments, and to the black cod caught off the coast of Iceland in the vicinity of the volcano, Mount Heckla, where the sea-floor is covered with black gravel derived from the volcano, and from lava blocks which have been broken down

by wave attrition. Here, also, other fish such as soles, plaice, haddock, halibut, and flounders are black, though this is not their normal colour elsewhere. Albino cod were also taken during the cruise. Obviously, in the face of such variation, little reliability can be placed on coloration as a criterion in establishing some fish species.

2. *Effect of Temperature*

Variations in the average water-temperature conditions in which fish live do, however, have definite and recognisable effects. We have already seen that relatively few species, often prolific in numbers, have succeeded in colonising the colder waters.

We may again select the typical fish, the cod, as our example. It is essentially a cold-water fish—I have found it to occur quite plentifully off Labrador and on the Newfoundland Banks at temperatures around 1° Centigrade below zero, and it occurs commonly at temperatures below 7° Centigrade. On the east North American coast it occurs from Labrador, where the temperatures are around zero and the growing season is correspondingly short, southwards to the New England coast, where temperatures are considerably higher. McKenzie (1934), has shown in aquarium tests that cod will feed and live in water up to a temperature of about 19° Centigrade.

From a study of the vertebrae and the scales of cod over most of the above region, I was able to deduce that the entire cod population could be split into what may be termed races, each exhibiting certain definable characteristics according to the zone occupied in the total north-east to south-west distribution. There was, for example, a fall from around 55 vertebrae per fish on the cold Labrador coast to about 53 in warmer waters influenced by the Gulf Stream (Thompson, 1943). Similarly, for the East Atlantic, Schmidt (1930) has found a decrease from about 54 vertebrae in the colder northern waters to about 51½ vertebrae in the warmer southern waters. These are, of course, average figures.

A somewhat parallel effect of temperature can be traced from a comprehensive study of the scales of the cod. Under magnification the scales show what may be called annual zones, each containing a number of circular ridges, which we will call circuli. This is shown clearly in colder waters (Plate I, fig. *a*), where there is a long winter break in growth, and less clearly in warmer waters, where growth is more continuous. Counting the circuli in the first year zone of scales taken over a great range, I found that the average number varied from eight in the cold (Labrador) northern waters to about 20 in the warmer (Nantucket) southern waters. We may also see the imprint of the varying environmental conditions of this region in the scales of the salmon. Along with a co-worker (Lindsay & Thompson, 1932), I found that the average number of years spent by salmon in the parr stage in rivers, before entering the smolt stage and migrating to sea, varied from two in the warmer rivers of the south-west to six (with one case of seven) in the colder rivers of the north-east. Obviously, it takes much longer for salmon parr in the short summer of the cold north to attain a size at which migration to sea can be essayed.

In the large Australian area, where there is a wide range of water temperatures, we naturally find different species of fish acclimated to different regions. For example, several species of eels, each with its specific habitat, have been shown to occur, each in a more or less circumscribed region.

In the case of birds, it is common to find that migrations occur between warm feeding and cool breeding climes. Somewhat similar movements can be discerned in, for example, the case of the North Sea haddock, which has been shown (Thompson, 1927) to carry out annual migrations from northerly spawning to more southerly feeding grounds, the net average migration being over a space of about 2° in latitude.

It would appear that temperature requirements are fairly specific for spawning, whereas fish will spread out and feed over a much wider temperature range.

It is noteworthy that cod eggs, held in water of zero temperature, hatch with difficulty, and only 50 per cent of them develop at all, taking 40 days in the process, whereas at 9° C. hatching occurs in nine days.

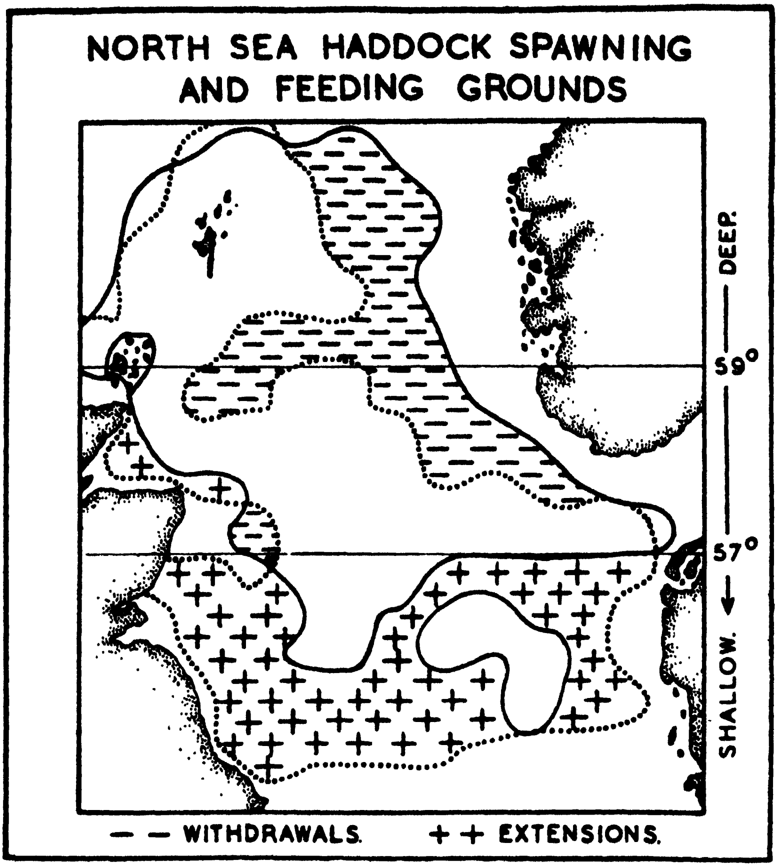

FIG. 1.—North Sea Haddock.
Limits of main spawning grounds—Fulcrum at approx. 59°N. Lat. Limits of main feeding grounds—Fulcrum at approx. 57°N. Lat.
In general, spawning takes place in the deeper northern waters.

In the warmer Australian waters hatching of fish and shellfish eggs takes place very rapidly. This would appear to be a favourable factor and should, in particular, aid in cultural experiments, some of which are about to be attempted.

Thus it is intended to attempt to introduce the Pacific oyster *(O. gigas)* from Japanese to Tasmanian waters. It has hitherto been introduced to east Pacific waters with considerable success, but the lower water temperatures there have hindered successful spawning. The difficulty has been got over to some extent by suspending the oysters in floats where the water could attain a higher temperature. Similarly, it is intended to experiment with the artificial culture of the pearl-shell oyster in tropical Australian waters.

Transplantation of fish to neighbouring but better feeding areas has been successfully accomplished. For example, plaice have been transferred from the

coastal waters of the North Sea to the Dogger Bank, where water temperatures are higher and there is plentiful food. The result was an increase in growth rate. However, as was indicated above, transplantation to entirely new regions is often a matter of great difficulty. For example, attempts to introduce herring and lobsters to New Zealand waters have failed. Better results appear to be attending current experiments to transfer lobsters from the West Atlantic to British Columbian waters (Pacific Fisherman, August, 1947).

Sudden temperature changes of any considerable extent are lethal, as are extremely low or high temperatures. For example, the past winter was a very severe one in the North Sea, temperatures as low as 1·7° C. at the surface, and minus 1° C. at the bottom, being recorded. Observations are to be made on the effect of these low temperatures on the plaice. When extremely cold winters have occurred in the southern North Sea in the past, large numbers of fish have succumbed, since the water is shallow and fish cannot have recourse to deep water which might be of higher temperature. Even in the case of Newfoundland cod, which are acclimated to very low water temperatures, sudden changes in temperature may be lethal. Such changes can occur when cold Arctic water floods a slightly warmer area. The cod are at times killed and float to the surface. Thus I have related (Thompson, 1943) an instance where a vessel, in the Gulf of St. Lawrence, steamed through 20 miles of sea where dead codfish, floating at the surface, were observed.

Instances are even known of cod having been driven by seals from deep water to very cold surface water, where the fish were paralysed by the cold, and killed.

It seems certain that the cod is sensitive to very slight temperature changes. During experimental fishing on the Grand Bank of Newfoundland, I found that in a given locality the fish were consistently aggregated in water of a certain temperature, and that in a nearby locality, where the water temperature was less than a degree higher, they were consistently absent. In general, cod were found at spots where lower temperatures prevailed, and haddock in neighbouring localities where temperatures were a very few degrees higher. Bull (1936) has shown experimentally that cod are sensitive to a change of temperature of less than one-tenth of a degree, thus confirming a finding in the field and carrying it to a finer degree of precision by aquarium tests.

Enough has been said to show the very great influence of temperature on the welfare of fish. In Australian waters sudden changes of water temperature are less in evidence, at least in the lower temperature ranges. Where fish welfare is affected and mortality is caused by extreme temperatures it is usually due to high summer heating of limited bodies of water—particularly bodies of fresh or brackish water. Death in such cases may, however, be due to deoxygenation of the water through putrefaction of plant and other life which has succumbed.

3. *Effect of Salinity*

Little need be said on the subject of the effect of water-salinity on fish. It is well-known that fish in general are divided into fresh- and salt-water species respectively, although certain fish, such as salmon, mullet, and eels, spend different phases of their life in fresh and salt water respectively. As in the case of temperature, however, sudden and extensive changes of salinity are lethal. Such changes can, for example, take place at river mouths in the case of the occurrence of floods, with severe effect on shellfish, such as mussels and oysters. It is, of course, customary for sea-running trout, as a defensive measure, to accustom themselves very gradually to the change-over from fresh to salt water, thus avoiding abrupt changes in salinity.

The Important Role of Nutrient Chemical Constituents of Water

Production of food in the form of fish flesh depends ultimately on the availability in the water of nutrient salts, such as phosphates and nitrates, just as crop production on land depends on similar nutrients in the soil. In the sea, when temperatures begin to rise in spring, there is, in the upper or phototropic zone, an outburst of microscopic plant life or microvegetation, production of which goes on until the nutrient salts are used up. This vernal outburst of plant growth provides food for minute marine organisms, which in turn form the food of the small larvae and fry resulting from the hatch out of fish eggs. These tiny fish are part of the food of larger fish, which at this period of the year feed well and

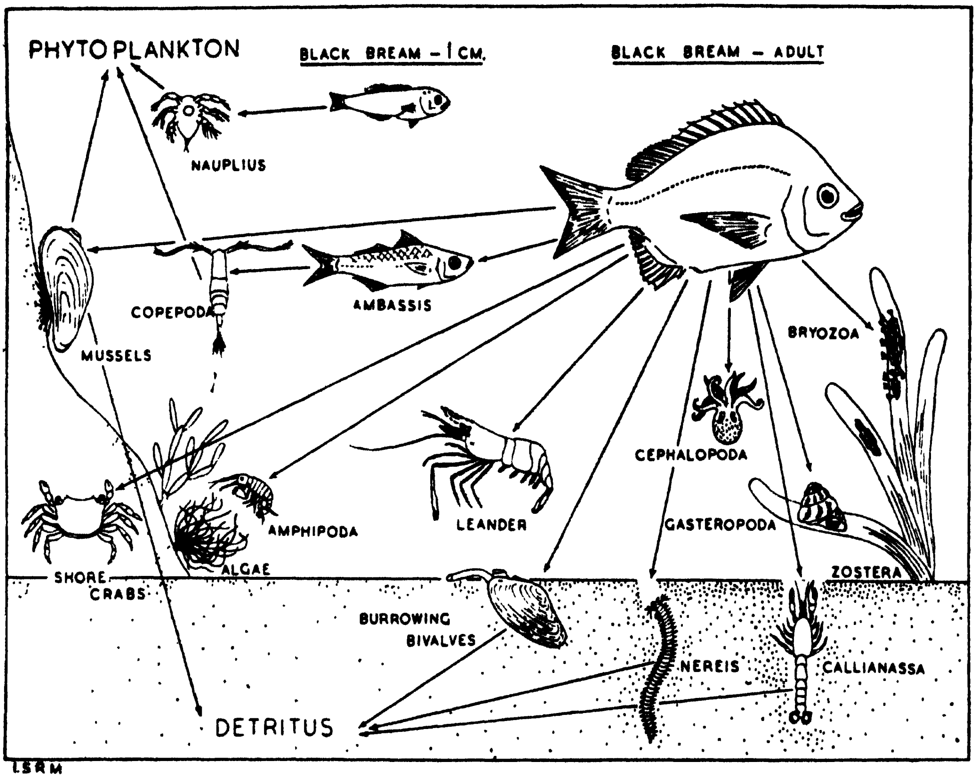

FIG. 2.—Diagram illustrating the food cycle, culminating in the organisms fed on by the Black Bream (after I.S.R. Munro).

increase in size. In tropical and sub-tropical waters where there is pronounced stratification of water layers—with the warm water normally on top—salts are exhausted after a very few weeks or months, and the outburst of growth of microscopic plankton dies out. It is during this period that fish, e.g., mullet, put on most of their year's growth. In certain localities, however, there may be more or less continuous re-introduction of nutrient salts to the surface waters through the mixing of nutrient-rich waters from deeper layers by favourable currents or swirls. Particularly is this the case where persistent cold currents flow in from high latitudes and cause mixing. As an example of this phenomenon the Humbolt Current, flowing up the western coast of South America, may be mentioned. This region is renowned for its high production of plankton, which supports a great sea-bird

population, which has given rise to the great guano deposits of Chile and Peru. This cold current normally dominates the situation, but, to quote the words of D'Arcy Thompson (1937) 'now and then persistent northerly winds check it or thrust it aside. Then comes el Nino, a new warm current upsetting the old equilibrium; the fish die in millions, the water stinks, the birds starve, the guano industry cries aloud'.

To the south of Australasia there is a kindred movement of water, containing a certain admixture of cold Antarctic water, which, while it reaches the South Island of New Zealand, keeps well to the south of the southern coast of Australia. Even Tasmanian waters, the coolest of the Australian seas, do not receive this Antarctic water component, nor do they contain typical Antarctic organisms in the plankton. It should be mentioned that one method of determining the source or sources of water masses is to study the types of the organisms in the plankton. I have made an intensive study of the Tunicates in the plankton of the south-eastern Australian region (Thompson, 1942) and have found tropical and sub-tropical species to be present in great numbers, but have not detected the occurrence of any one of the very few species which occur in the Antarctic.

In the cold water of high latitudes there is much greater upwelling of deeper water, with copious phosphate and nitrate content. This movement occurs owing to the action of the currents, and mixing is also caused by convection which occurs when sharply cooled water descends in winter owing to its greater density. In the warmer parts of the ocean this mixing by convection is much less prevalent, the tendency being towards stratification of water layers, with the warmest water remaining near the surface.

In general, therefore, it is not surprising that phosphate values are high in Antarctic waters, and comparatively low in tropical and sub-tropical waters. These values can be expressed as units denoting parts of P_2O_5 per cubic metre (or one million cubic centimetres) of water. Values of from 50 to 100 units occur in Antarctic seas, and values of around 15 in Australian waters. It is therefore not surprising that plankton production appears to be greater in colder than in warmer seas, and that Jespersen (1935) found that, as far as his investigations went in the Tasman Sea, the relationship between the amount of plankton taken with a stramin net was reciprocal with water temperature. In a passage from east to west across the Tasman Sea he found rising temperatures between New Zealand and Australia. As the water temperature increased, so did the volume of plankton, obtained by a standard technique, fall.

Since total fish production is dependent, in the ultimate issue, on total plankton production, the colder waters of the world naturally produce the heaviest and most consistent fish catches. This appears to be due to the greater and more prolonged availability of nutrient salts and not essentially to lower temperature itself, since, as I shall now show, low temperature alone does not necessarily produce fastest growth in any particular species such as haddock, cod, or salmon. Indeed, the artificial introduction of nutrient salts to warmer waters can lead to very fast growth of fish. Thus, I am informed by Mr. Dunbavin Butcher that in Lakes Parrumbete and Coleraine in Western Victoria, Australia, the growth rate of introduced Quinnat salmon is very fast indeed. These lakes receive drainage from a rich agricultural hinterland, and hence are well supplied with nutritive salts. This suggests a task for the research worker—to show to what extent the productivity of rivers, lakes and ponds, and, possibly, of suitable estuaries, can be increased by the controlled addition of fertiliser or of superphosphate or other nutrient salts.

Variation in Growth Rates, e.g., of Haddock, Cod, and Salmon

My own first assignment in the field of fishery research was to a study of the haddock of the North Sea. This was in 1921. At that time there was considerable controversy as to the value of fish scales in indicating age. Hoffbauer (1898) had shown that, in carp, the scales showed annual rings. The position was, however, that proof had to be produced, species by species, that annual zones could be recognised on the fish scale. As I will show later, it was possible to produce this proof in the instance of most haddock, and it has been possible to do so also for many other fish species. But some species have proved troublesome. Thus the cod scale, except (Plate I, fig. *a*) in regions where there is a sharp difference between summer and winter temperatures, is not easily interpreted. Another prolific fish, the common herring of commerce, has been the subject of much controversy on this score, attempts having been made to prove that the numbers of apparent zones on the scales could be explained according to the laws of chance. Intensive research, which has indicated among other things that in the North Sea there are spring and autumn spawning seasons, has explained away most of the anomalies, and critics of the acceptance of the scale-age theory for herring have now been won round to the acceptance of this theory. In the case of haddock, the position was that whilst Norwegian workers claimed the age could be read with certainty from the scales, English workers had found at least a proportion of the scales unsatisfactory for age-determination owing to extra markings. There is sometimes one such extra ring found during the first year, when haddock change over from mid-water to bottom feeding conditions. I have also shown (Thompson, 1926) that, in transferring haddock from sea to the aquarium, the change in conditions can cause an extra ring to be formed. The position to-day is that most workers use the scales in the case of younger haddock, but that in regions such as Iceland waters, where many older haddock occur, otoliths are used as giving a clearer indication of age than do scales.

Within two or three years of commencing studies on haddock scales, I was impressed with two indications—the first of which was that fish of the same age attain different sizes in different regions. Thus there is gradation from the deep waters of the northern North Sea—where low temperature and scanty food supply (even *Foraminifera* are resorted to as food) restrict growth, and where a large size could never be attained—through the more genial conditions of shallower banks (e.g., Dogger Bank) and of inshore waters, to the regions of fastest growth, where food is most plentiful. Such regions are the west Scottish coast, subject to Atlantic conditions and, further afield, Faroe, Iceland, and the west Atlantic from Grand Bank, Newfoundland, to Brown's Bank, Massachusetts.

A region of fast growth will obviously, by providing fast recuperation, sustain a more intensive fishery than will one of slow growth. It is therefore of fundamental importance in fishery investigations to study rates of growth. Prior to the institution of current investigations, this had not been done in Australia. In recent years the growth rates of mullet, bream (Plate II), pilchard, &c., have been determined, and this work is proceeding with respect to other fish such as salmon, tuna, barracouta, and trawled fish such as flathead. In the latter case—the flathead—the tiny ear bones (otoliths) are being used (Plate III). Even in the case of the scallop—a shellfish—it is being found possible to make use, in general biological studies, of the periodic markings on the shell (Plate I, fig. *b*).

FLUCTUATIONS IN FISH STOCKS

The second indication that impressed me was that the year classes were not equally represented in the total haddock population. It soon became clear that the survival rates from successive spawning seasons varied, sometimes very greatly (Thompson, 1922). Norwegian workers had previously shown that in the case of the herring one year class could be born and survive in such great quantities as to form the major part of the catches for a series of years. In the case of haddock something similar was soon shown to occur. The year classes of 1920 and 1923 were, in succession, dominant, and those of the intervening years 1921 and 1922 almost complete failures. I found it difficult to convince some of my colleagues of the truth of this at the time—so much so that in 1922 extra cruises were organised to scour the North Sea for the baby haddock which, it was assumed, should be present, but which had not shown up in any numbers in the catches of the experimental trawler. At this time interest in the position of the haddock fishery was stimulated. We had seen an increase in the haddock stocks, occasioned by the rest period—one of recuperation—enjoyed by the stocks during World War I, when, as during the recent war, fishing activities were greatly reduced in the North Sea. In 1919, the year following the war, large haddock were four times as plentiful as they had been in 1913, the year before the war. A rapid sequence of events followed—the resumption of the fishery, which rapidly reduced the haddock stocks to a much lower level, and the failure of two successive year broods—those of 1921 and 1922, which further reduced fishery returns to an unprecedentedly low and unremunerative level—so that it was commonly thought in the trade that the fishery was finished with, at least for the time being. I therefore published a forecast in these words 'The 1920 brood in 1923 and 1924 should allow the haddock fisheries to recover from their present depression. Should this prove to be true, the scale theory, as far as the formation of one ring per year goes, should, in the main, be established for the haddock'. As was anticipated, catches turned upwards in 1923. The 1920 brood was being caught at commercial size, and formed 70 per cent of the total haddock catch in 1923. Furthermore, whereas in 1922 little trace could be found of baby haddock, in 1923 the research vessel found them in prolific numbers over most of the northern region, and it was possible (Thompson, 1923) to predict the further recovery of the haddock fishery in 1924 and 1925, when the 1923 fish would have attained marketable size. From that time, through a sustained study of the relative degree of success of successive year broods, a prediction system for North Sea haddock was maintained.

In more recent years forecasts have come to be made with regard to other fish whose biology has been intensively studied. Thus Hickling (1946) states that in any one year the abundance of small hake likely to occur to the south and south-west of Ireland can be forecast five years in advance, if the temperature of the sea surface in that year is known. A high temperature at the surface means a high survival rate of newly born hake. In the case of haddock the causes of good and bad survival rates are not known. They might include absence of suitable food supply for the myriads of young fry, or even the carrying by adverse currents of the eggs or early pelagic stages into regions where conditions for further development are unsuitable.

The study of growth rates and the study of fluctuations may therefore be bracketed together as being of fundamental importance to commercial fisheries. Examples have been drawn above from authenticated cases in large fisheries studied over a period of years. In Australia similar studies are now in progress and already we see signs of useful results. An instance (flathead fluctuation) will be mentioned below.

The Influence of Man on Aquatic Life

Yonge (1947) states that man had little direct influence on marine life till about two hundred years ago, when there began a vast and indiscriminate slaughter, leading to the extermination of some species—for example the Northern Sea-Cow in the north Pacific. Another member of the sea-cow group (Sirenia)—the dugong of Indo-Pacific Seas—still survives, but requires protection. The population of whales in Arctic regions has been reduced to very meagre numbers, and that of the Antarctic, upon which the modern highly mechanised whaling industry is based, has also suffered great diminution and is receiving a measure of protection. Ommanney (1938), commenting on the position with regard to the elephant seal, states that at South Georgia, where killing is restricted to old bulls, numbers are being maintained, whereas on other islands where no regulatory measures have been adopted, this seal is dying out. It is the function of scientific investigations, such as those carried out so successfully by the 'Discovery' expeditions between the two world wars, to secure the necessary fundamental biological information upon which to base measures of conservation or, to use the words of D'Arcy Thompson (1937) 'to tell the commercial world how far greed might safely go'.

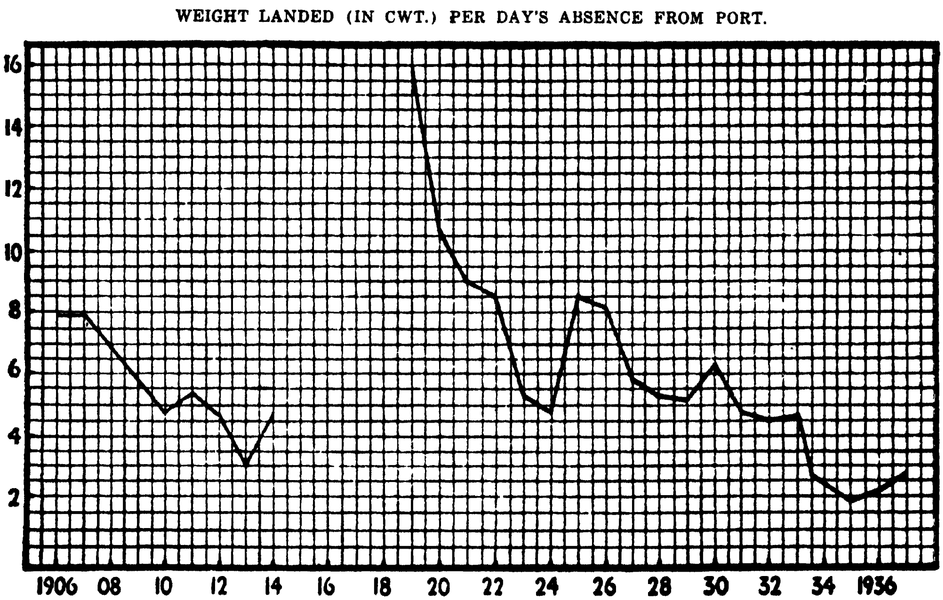

Fig. 3.—Graph showing weight (in cwt.) of haddock landed per day's absence by English steam trawlers in the North Sea.

Declines are shown prior to both world wars, but a considerable recovery is evident in 1919, subsequent to the recuperative period of 1914-1918. (Data from Russell, 1942.)

The scientific study of fish populations has usually been introduced long after the fishery has been taking its toll and has reduced the stocks. It is therefore impossible to say exactly how great these stocks were in their pristine condition. The occurrence of two wars within a generation has, however, through providing a partial closure of certain areas to fishing, given us some idea of how far depletion can go and how extensive the recovery can be in certain cases at least. Dr. E. S. Russell (1942) says that the average landings of haddock in hundredweights,

per days' fishing, by English steam trawlers was 7·8 in 1906. By 1914, at the beginning of the war, it had dropped to 4·6, but it recovered to 15·8 in 1919, at the conclusion of the war. However, by 1937, it had receded to a new low of 2·7—a desperate situation. Here we see unmistakable evidence of a fall due to increased fishing intensity up till 1914, a very marked recovery by the end of the war, and a subsequent and still more pronounced drop up to 1937. From a report (1946) on the sea-fisheries of England and Wales for the years 1939-1944 inclusive, we learn that the North Sea was closed throughout World War II, except for a belt down the east coast varying from 15 to 30 miles wide. The landings of demersal fish fell in 1940 to 31 per cent of the 1938 figures, and still further to 24 per cent in 1941, afterwards rising slightly. The report says that there has been in several areas a marked increase in the weight of fish on the grounds, due to the decrease in the intensity of fishing, this increase being of the order of from 250 to 400 per cent, according to area, and as measured by catch per unit of fishing effort. Besides being more numerous, the fish were larger than before the war. Here is a statement taken from this report: ' It is common knowledge that after the 1914-1918

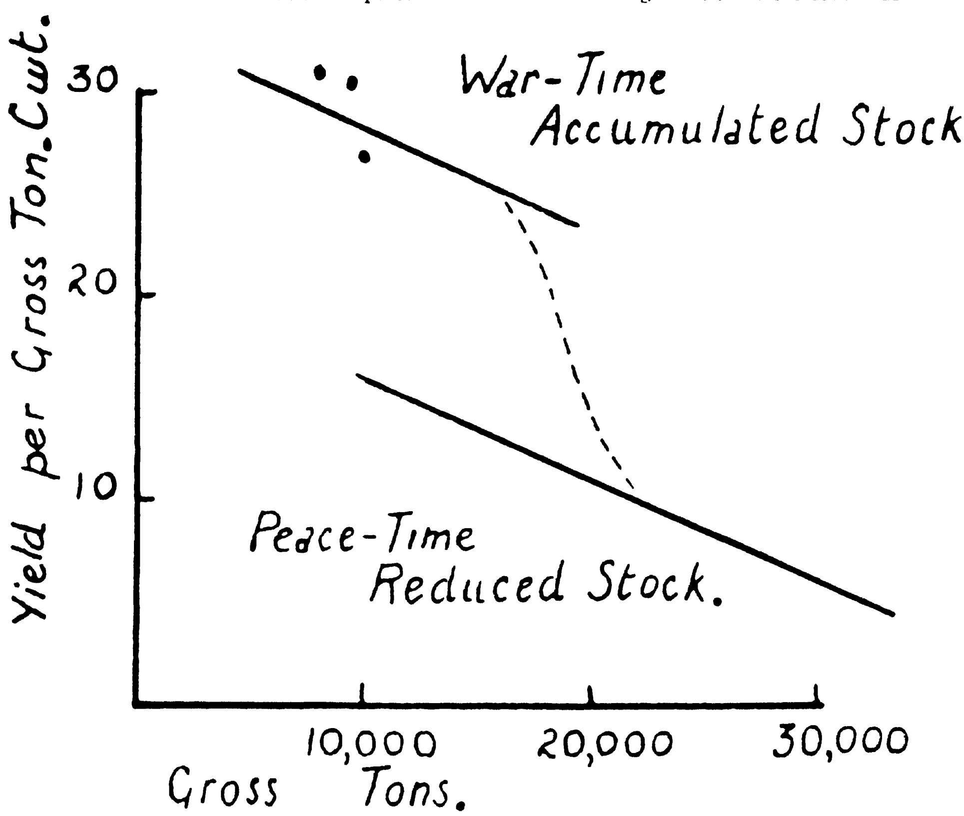

FIG. 4.—Transition from a ' war-time accumulated stock ' of hake (in south-west British area) to a ' peace-time reduced stock ', with increase in the size of the trawling fleet. The relation between the size of the fleet, in aggregate gross tons, and the yield of hake per gross ton, in the years 1920 to 1938, is shown as the regression line marked ' peace-time reduced stock '. The regression line shows that, the larger the fleet, the smaller the yield of hake to each unit of the fleet. A second regression line, parallel with the first and marked ' war-time accumulated stock ', is drawn through the points representing the yield per gross ton in 1942, 1943, and 1944. (From Hickling, 1946.)

war there was an uncontrolled scramble . . . to send trawlers and other fishing vessels to those fishing grounds which had been closed for the duration of the war, without any regard to the consequences. For a year or two large landings and high prices resulted, but the inevitable slump followed and fishing became uneconomic. By the time the World War was in sight most of the British vessels working this area were working at a loss . . . . The North Sea had, in fact, been overfished, and the same was true of other areas. So many fish had been taken out that the remaining stocks could not maintain themselves'. Hickling (1946, 1946*a*) also states that since 1939 there was a spectacular improvement in the catch of fish per unit of fishing effort on Porcupine Bank, off the west coast of Ireland. The increase extended to many fish species and varied from 50 per cent in the case of small to 200 per cent in the case of large trawlers. With regard to hake, he states that the rate of reduction of stocks fell from 46 per cent per annum before the war to 21 per cent during the war. Consequently, from 1942 to 1944 a fleet reduced to 8000-9000 tons landed more hake than a previous fleet of 20,000-29,000 tons. In 1945 a fleet of less than 10,000 tons caught two-and-a-half times the amount caught in 1932 by a fleet three times as large.

However, Hickling, who recently visited Sydney, has informed me that North Sea catches have already fallen by about 50 per cent from the high level of the immediate post-war period. With regard to hake, which is fished chiefly on the western fringe of Ireland and Scotland, and hence mostly outside the North Sea, he shows the transition from the war-time accumulated stock to a peace-time reduced stock, occasioned by the increase in the size of the trawling fleet. For the period 1920-1938 he draws a regression line (the upper line in the accompanying diagram) showing that, the larger the fleet, the smaller was the yield per unit of effort expended. For the period 1942-1944 similar regression line has been drawn through points indicating yields per gross ton employed in the fishing fleet.

Other fish stocks now show similar war-time and inter-war-time trends. Thus G. A. Stevens (1947) states: 'Before the outbreak of the 1914-18 war and for a few years after its close the Cornish long-line fleet, working from Newlyn, used on an average to work from 1000 to 1500 hooks per vessel on from 2½ to 3 miles of line. Gradually they became obliged to use from 2000 to 4000 hooks on from 5 to 7 miles of line in order to catch the same amount of fish, or rather less. Moreover, instead of fishing as a rule within a radius of 50 miles from the port they had to operate on grounds up to 90 or even 100 miles distant. In due course no further increase in the amount of gear that could be used from the existing vessels could be made. The extreme limit of their range was also reached, and the catches continued to fall . . . . But war came and the grounds were rested, and catches were good once more'. The fishery referred to the elasmobranchs, or gristly fishes, the rays and skates, and we see a somewhat parallel state of affairs in the south-eastern Australian fishery for another elasmobranch fish, the school shark. This fishery received an impetus during the war on account of the need for liver oils rich in vitamin A, and Victorian fishermen have found it necessary to go further and further afield for good supplies.

Similarly, with regard to some crayfish grounds, the areas covered by fishermen in order to secure an economic catch is steadily increasing. In New Zealand and South Africa there has been little recovery in some areas where stocks of crayfish have previously been reduced to low limits.

With regard to the important trawling industry of New South Wales, investigations have been and are being made on the level of the more important fish stocks. The peak in this fishery was reached in 1929, when 15 million lb. were taken by 17 trawlers. There was a subsequent drop to a low of 10 million lb.

in 1935, but a reduction in the number of trawlers to 13 enabled the stocks to recover and a steady return of about 12 million lb. by 13 vessels can apparently be sustained. There was marked over-fishing from about 1928 to 1935. In the earlier days (1918-1926) this fishery produced from 5-7 cwts. of fish per trawling hour, compared with 2-2½ cwts. in the period 1930-1940. There was a phenomenal increase in the smaller (Danish seine type) trawlers in the late war and in the post-war years, so that in 1946-1947 there was a total fishing effort from a fleet of about 4600 trawler tons, compared with 4000 trawler tons in 1929. At present there is a fishing potential of over 5000 trawler tons, whereas a figure of about 3500 appears to be the maximum required if stability of fishing results is to be maintained.

There is no evidence of any very remarkable increase in stocks (on North Sea standards) during the war. The position is that the average catch of tiger flathead—the chief trawled fish—has dropped quite considerably since the war, and this decrease in flathead has directed more attention to the taking of other varieties of fish, such as morwong. It should be mentioned that Tasmania is interested in the trawl fishery to a more limited extent, the research seine trawler 'Liawenee' having from time to time made good catches off the east coast of the island.

Obviously, while it is certain that Australian fishery resources are far from fully utilised, there is a distinct need for careful management in some instances. This is necessary if the maximum return is to be achieved over an indefinite period, as it can be. A limit must be placed to the degree of exploitation in the case of most fish species (an apparent exception being the prolific herring in the North Atlantic). There is a limit to the number of new grounds which can be turned to, and the hatching and turning into the sea of fish fry has never been proved to be beneficial. Useful measures which can be taken, once sufficient basic data have been accumulated to suggest what they should be, may include the avoidance of the capture of a great proportion of what are termed undersized fish, whether by increasing the size of the meshes of nets, or by instituting minimum size limits of fish to be marketed; protection of spawning fish or spawning grounds; and limitation of the total permissible catch. One or two examples may be cited.

In 1935 W. C. Herrington, after investigating the alarming decline in the catches of haddock on the once prolific George's Bank off the east coast of the United States, drew attention to the effect of using in the cod-end of the commerical trawl a mesh of only 3 inches. He indicated that trawlers once destroyed 63 million baby haddock in one season and advocated a 4¾-inch mesh in the cod-end. His experiments, carried out on a commercial scale, showed that four-fifths of these brood haddocks could be allowed to escape without reducing the amount of marketable fish captured. At the 1935 meeting of the North American Council on Fisheries Investigations, at which I was present, an international treaty was favoured to protect the fisheries of all banks. Nothing however was done. In the fisheries journal 'The Atlantic Fisherman', of January, 1947, it is stated that the Atlantic Fishermen's Union drew up, in 1942, a bill to be introduced to Congress, limiting the size of fish to be marketed and restricting fishing during the spawning season, but no one would sponsor the bill in Congress. The journal goes on to state that fishermen are now finding it necessary to go further from the home port.

It is of interest to note that similar experimental work in the North Sea has shown that an increase of mesh would spare a proportion of young fish without reducing the marketable catch. Since it was known that the fishing grounds of western Europe were again well stocked after the war, the British Government called an international conference in London in 1946 to discuss the over-fishing

problem. It was agreed to increase the mesh size of nets, and also to set a size limit on 12 of the most important demersal ground fish. An advisory committee was also appointed to give special attention to the matter.

In the case of the Australian flathead it is now proposed to test the effect of using a 3½-inch, instead of the existing 3-inch, mesh in the cod-end of nets used by trawlers, the object being to allow a considerable proportion of small and unsaleable fish to escape Thus it should prove helpful if the small two-year flathead were allowed to escape and grow to a larger size. But quite apart from this conservative measure, it may also prove to be necessary to restrict the total tonnage of the fishing fleet, or to protect spawning fish.

In the case of the Pacific halibut, a sharp decline in stocks has been checked and the downward trend reversed—in this case, not by the intervention of a war period, but by the application of conservative measures based on scientific evidence. Through treaties subscribed to in 1924 and 1930, and renewed in 1937, by Canada and the United States, limits were set to the quantities of halibut to be taken, and certain important spawning grounds were protected. The halibut population has, as a result, greatly increased and the fishery has been rescued from its state of reduction to an uneconomic level. Here, as elsewhere, it has been abundantly shown that, paradoxical as it might appear, a greater quantity of fish can, in the case of some fish stocks at least, be taken by reducing the actual fishing effort.

Aids to the Fisheries from Research

The increasing tendency towards management of the fisheries on a scientific basis has manifested itself during the period between the two world wars. As in the case of forest management, it has come to be realised that only the natural increase can safely be removed.

During this period, scientific investigations have laid bare, or emphasized, certain truths of first-class importance. Let us recapitulate some of the chief of them.

1. Fundamentally, productivity in the sea, as on land, depends on the *availability of nutritive salts* such as phosphates and nitrates. The action of light rays, which penetrate to a depth of about 200 metres, creates a plant life upon which a herbivorous fauna grazes, this fauna being, in turn, utilised by animal life up the nutritive chain. The normal colour of water is azure blue, on account of its ability to absorb red rays. On fishing banks, such as the Newfoundland banks, the colour is green on account of abundance of microscopic plant life (diatoms, etc.), aided by matter in suspension. On banks, and in cold water generally, the supply of nutritive salts tends to be regenerated by mixing caused by water movements (upwellings, eddies, convection, etc.) after the supply of nutritive salts has been exhausted, as they tend everywhere to be by the outburst of growth ('flowering') each spring when temperatures begin to rise. Thus, as D'Arcy Thompson (1937) states, a vast abundance of life strikes every naturalist in Arctic or Antarctic seas, the coldest of Antarctic waters being the richest in the world. Commenting on the results of the investigations of the 'Discovery' expeditions, he states that the gathering places of the whales may be expressed in terms of plankton (e.g., the big shrimp-like *Euphausia superba* which is the staple food of the blue whale) and also of the phosphate supply.

   A systematic survey of the availability of nutritive salts in Australian waters, which are tropical and sub-tropical, is proceeding. The general level is not high, although there are exceptions where local mixing occurs.

In fresh or in more or less closed waters it may be possible to augment phosphate supplies by artificial addition. This may, for instance, be of interest in the rivers and lakes of Tasmania. These will always provide satisfactory angling for the few, but to provide it for the multitude it will probably be necessary to adopt artificial measures, possibly including feeding under control as practised abroad. For example, at Healing, in North Lincolnshire, near the fishing port of Grimsby, rainbow trout are forced to a weight of about 6 ozs. in a year by being fed each morning in ponds with minced small cod and whiting, which are cheap at the fish market at Grimsby. (Barracouta might similarly be used in Tasmania.) Well over 100 lb. of trout are sold per week, each pound of trout requiring about three pounds of cheap sea food for its production.

It should be noted, however, that plankton is not necessarily uniformly distributed in water where nutrient salt content is uniform. As Lucas (1947) has pointed out, it has been shown in recent years that many organisms appear to require certain substances (e.g., of the nature of enzymes, hormones or vitamins) which they themselves cannot manufacture, and which are not normal foods. These substances may either stimulate or inhibit various biological processes. Thus the presence of some plants, when abundant, may have an inhibitory or even a lethal effect on associated animals, virtually 'excluding' them. This may be due to the effect of external secretions of such plants. Thus 'krill'—and therefore whales which feed on it, have been shown to avoid water of the highest degree of plant productivity. Likewise, Savage and Hardy (1935) have shown that the presence of dense patches of plankton (e.g., certain diatoms) over the normal herring fishing areas of the North Sea can be associated with poorer than average herring catches.

2. A second finding of supreme importance has been that *growth rates* of fish vary quite considerably. Within limits, growth rate is a function chiefly of food supply, and it is desirable to secure a high survival rate in areas where food is abundant. In areas of slow growth, only a restricted fishing intensity can be sustained. Increase of food by adding fertilisers to sea-water is still at the experimental stage, some success having been obtained in limited water masses (Gross, *et al.*, 1946). It is hoped to start preliminary fertilisation experiments in a freshwater area in Tasmania shortly, and such experiments have been instituted in connection with oyster cultivation in George's River, New South Wales. In densely populated regions of Asia, where manurial matter is abundant, large quantities of fish are, of course, produced by fertilisation of ponds, etc.

3. A third outcome of fisheries research during these years has been the production of proof absolute that, owing to natural causes, fish stocks fluctuate in number, the fluctuations being sometimes so violent as to be almost catastrophic in their effect. Perhaps the failure, in two successive years, 1921 and 1922, of North Sea haddock broods has so far provided the most striking demonstration of the disastrously low level to which fish stocks can be reduced when, with stocks already in an over-fished condition, spawning seasons fail to provide reinforcement of numbers.

From the continuous study of *fluctuations* and of the composition of age-groups of the stock, it has been possible to make short-term predictions of the course, not only of the haddock fishery, but of the fisheries based on other species (hake, herring, pilchard, etc.) in various regions. Such *predictions* are of obvious value to those concerned with outfitting for participation in

the fishery. Fortunately, in the case of any one species, fluctuations may affect one region more than another—thus the codfishery on the coasts of Norway and Newfoundland may be good now on one part of the coast, now on another; and, since the time of incidence of adverse fluctuations is not necessarily the same in different species, fishing effort can be directed from a species in an unfavourable phase to other species in more favourable phases. It is interesting to note, for example, that of the two great Californian fisheries, that for tuna was in 1946 the most productive on record, and that for pilchard the least productive. Thus those entering on new phases of the Australian fisheries would be well advised to equip their vessels for more than one type of fishing.

4. A fourth major finding in these last twenty-five years has derived from the gigantic, though involuntary, experiments in conservation imposed by the two world wars. It is that of the remarkable capacity for *regeneration* possessed by fish stocks which have been over-fished. After both wars fish taken in areas more or less closed to fishing have proved to be much more plentiful, and to be of a larger average size, than those taken at the commencement of hostilities. This is a heartening consideration, ensuring as it does positive results for such lesser measures of conservation as may be thought to be administratively advisable. The remarkable speed, and the extent, of the reconstitution of fish stocks towards a high level are doubtless largely due to the great fecundity of fishes—a fecundity not shared by marine mammals such as, for example, whales and seals. In the case of whales we know that a very great number of years must of necessity pass before a badly attenuated stock, such as that of the Arctic regions, can effect even a moderate recovery in numbers. In the case of the Bay of Biscay, for example, the Basque harpooners killed out the Atlantic whales, so that no more were seen for nearly 100 years. In the Antarctic, to quote Rudd (1939-41), 'the stock of the blue whales has been reduced to such a degree that the chance of catching a blue whale in 1938-39 was less than half of what it was in 1933-34, in spite of the increase in the efficiency of the boat and the activity of the gunner'. In other words, the stock of whales has fallen below a level which can be balanced by increased fishing activities.

Probable Future Trend in Fishery Research

It is to be anticipated that the tendency towards the application of scientific management to the fisheries will not only continue, but be accelerated, using techniques already to hand, techniques which may well be added to as further discoveries come to light. Thus, while fishing techniques for both pelagic (surface) and demersal (ground) fisheries have been well perfected, much might ensue from the development of methods of taking mid-water fish. Among other results there should accrue some much-needed knowledge of the mid-water phases of the life-histories of such fish as herring and salmon. Particular attention is likely to be given to causative factors in the occurrence of freshwater and marine life. A quarter of a century ago public interest, and that of the industry itself, in research was somewhat apathetic, but occurrences in the interim have quickened that interest. On all hands we see evidence of this. British fisheries research is being extended to cover the prolific, though distant, Arctic grounds, and a large-scale scheme of fisheries research is being planned (and in some cases has commenced) for the Colonial Empire. In the March, 1947, issue of the 'Pacific Fisherman', under the title of 'Tide of Research Rising', we learn of the intention in the United States to expend very large sums in research in its Pacific possessions

and the Philippines, and also that the great Californian sardine industry wishes Congress to provide $1,000,000 for research on the sardine stocks which, owing possibly to natural fluctuations, have at times yielded disappointing catches. At the request of member nations, the Food and Agriculture Organisation of the United Nations intends to set up Regional Councils for the stimulation and co-ordination of oceanographic research. One such Council is expected to be established for the Indo-Pacific region, including Australia.

In Australia, the activities of the Fisheries Division of the Council for Scientific and Industrial Research are being intensified with regard to securing the necessary data both for the further development of industries based on the marine resources, and for the rational management of such existing fisheries as are fully exploited.

With regard to the latter, for example, requests have been received from State departments and local authorities for investigations to be conducted into condition of various stocks upon which important fisheries are based, such as the New South Wales trawling industry, the Queensland mackerel, the Tasmanian whitebait and scallop, the school shark, the Tasmanian and other crayfishes, and the freshwater trout of Tasmania.

In Australia, as elsewhere, the prosecution of research is essential if only as a policy of insurance for the maintenance of existing fisheries; and in Australia, where fisheries are only partially developed, the outlay on such a policy must of necessity be increased to ensure expansion on a sound basis. At the same time, the expenditure on research must bear a reasonable relationship to the actual and anticipated commercial returns of the fisheries.

Developmental Possibilities in Australian Waters.

Having seen that some sections of the Australian fisheries have been exploited to the extent that there is already a call for their conservation, let us now comment on other sections, some of which are probably not yet fully exploited, and others of which—particularly those dealing with pelagic fish—stand at the threshold of exploitation subsequent to the carrying out of much exploratory work by aerial reconnaissance and research vessels. Existing fisheries which could sustain expanded effort are, in my opinion, those based on barracouta (the catch of which in Tasmanian waters has risen considerably in recent years, partly owing to the stimulation of war-time regulations—and there are distinct possibilities further afield, e.g., in Western Australian waters); Australian salmon, upon which a canning industry is already based, and the distribution of which, being easily studied from the air, it is proposed to determine with precision; school shark and crayfish, both requiring some aid from conservational measures in Tasmanian waters where they are most heavily fished, but both probably capable of supporting an expanding fishery elsewhere in southern Australian waters; the fisheries of tropical waters in general—including those based on pearls and pearl-shell, in connection with which improved cultural methods are to be tested; the oyster and scallop industries, both of which are now the objects of scientific study; and the sea-weed industry, founded during the war for the production of agar-agar, but, as far as Tasmania, at least, is concerned, capable through the existence of extensive beds of *Macrocystis*, of providing raw material for the production of alginates.

With regard to the development of the pelagic fisheries, we stand at a most interesting stage. The preliminary study of the distribution and seasonal occurrences of the surface fish is now being actively continued beyond the region of south-eastern Australia. In the latter region, including Tasmanian waters, this

study has been reasonably well completed, and efforts are now being made to develop the canning industry. On shore there have been installed the necessary cold-storage facilities to accept and hold occasional large catches, which can then be gradually passed through the canneries. The horse mackerel *(Trachurus novae zelandiae)*, since it had, during the appropriate season, frequently been observed to occur in dense shoals in more or less sheltered waters, was thought to be the first species of pelagic fish likely to be taken in quantity by the purse-seine net, and this has proved to be the case. Hauls have been made both in eastern Tasmanian waters and off the coast of New South Wales. So far several catches of around 18 tons each have been secured, and these may be expected to be improved upon with experience. The capture of tuna by purse-seine will also be attempted shortly. This operation calls for the exercise of considerable skill. Hitherto the method of jigging or trolling has been tried out in these waters with, on the whole, unsatisfactory results. The Division of Fisheries of C.S.I.R. is stimulating, and co-operating with, commercial interests and selected fishermen in the testing out of various types of fishing gear used in such work. This work extends beyond mackerel and tuna to smaller fish, such as pilchard, sprats, and anchovies. With regard to these three latter species smaller nets are employed and occasional catches of from a few hundredweights up to five tons have been effected. I think it can now be said with confidence that the development of an industry based on Australian pelagic fish has begun, and that this industry will reach significant proportions as compared with the already existing fishing industry, which is based largely on demersal and estuarine fishes. It is a virtual certainty that Australia, with its large seaboard, will share in a generally increased production from the marine resources of the southern Pacific, which at present yields only a paltry 2 per cent of the fishery products taken from the Pacific Ocean ('Pacific Fisherman', August, 1947).

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PLATE I

FIG. *a*.—Microphotograph of a typical scale from a Newfoundland codfish, showing four completed years of growth.

FIG. *b*.—One valve of the shell of a Tasmanian scallop, showing five apparent annuli and some growth in fifth year.

(Photos. A. Proctor.)

PLATE II

A bream, with a microphotograph of one of its scales showing four completed years of growth. The scale grows in proportion to the fish, and by measuring the annual increments in the scale, the rate of growth of the fish can be determined.

(I.S.R. Munro del. Photo. A. Proctor.)

PLATE III

Microphotographs of otoliths from six flathead:—

1. Length of fish 4 inches. No annulus yet formed in otolith.
2. Length of fish 7 inches. About to form second annulus.
3. Length of fish 11¼ inches. Two complete annuli; third about to form.
4. Length of fish 13¼ inches. Three complete annuli.
5. Length of fish 15¾ inches. Four complete annuli (first indistinct).
6. Length of fish 16¼ inches. Four distinct annuli; fifth just forming.

(Prepared by W. S. Fairbridge. Photo. A. Proctor.)

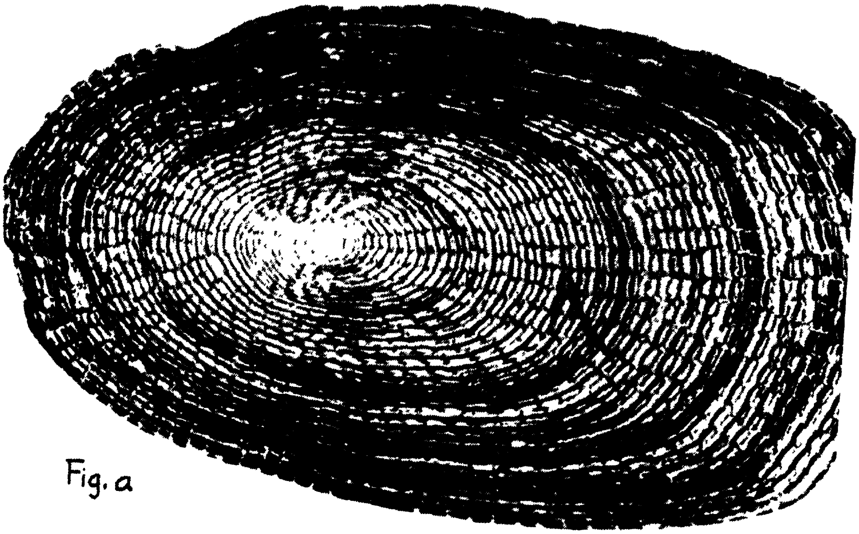


Fig. a

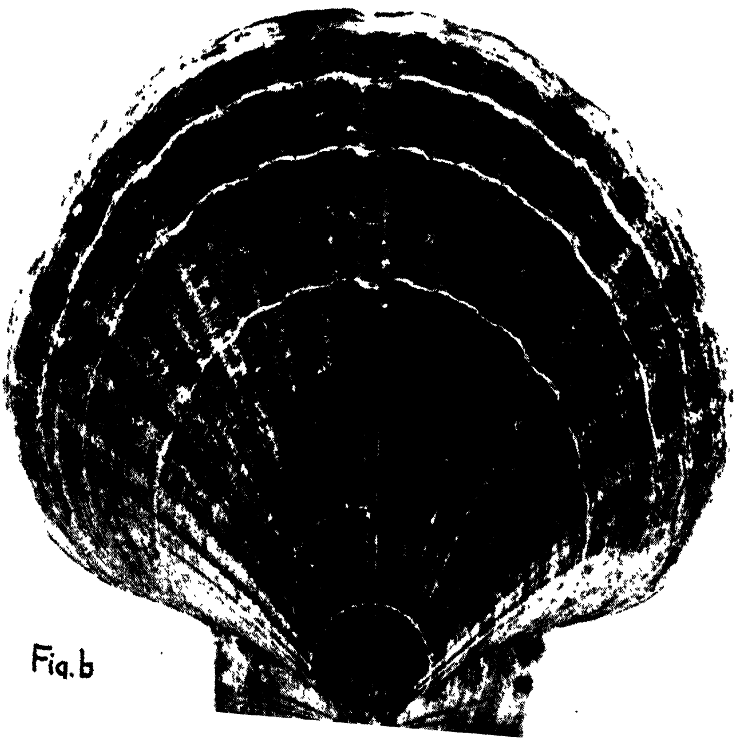
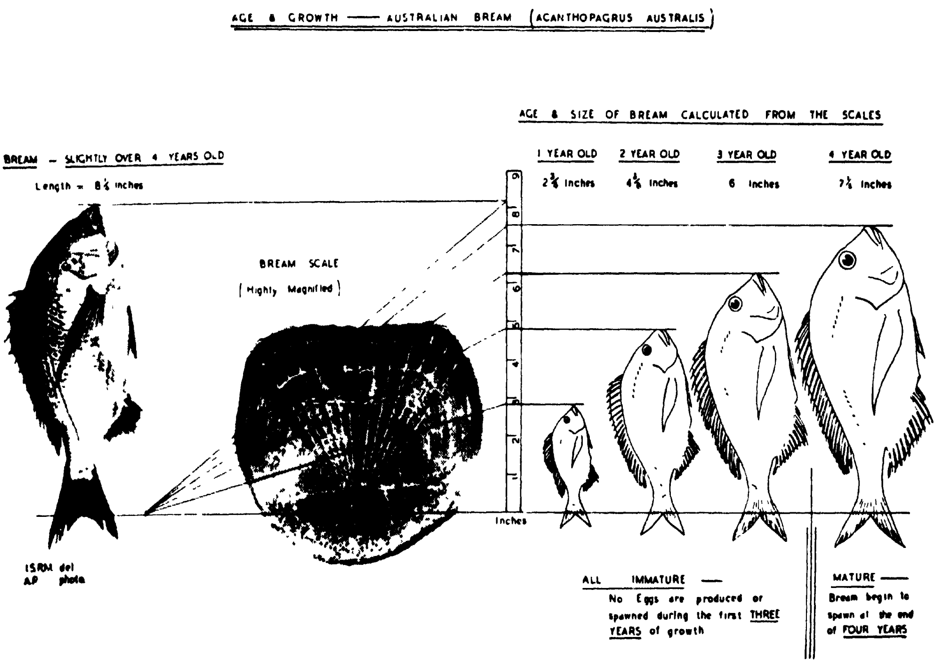
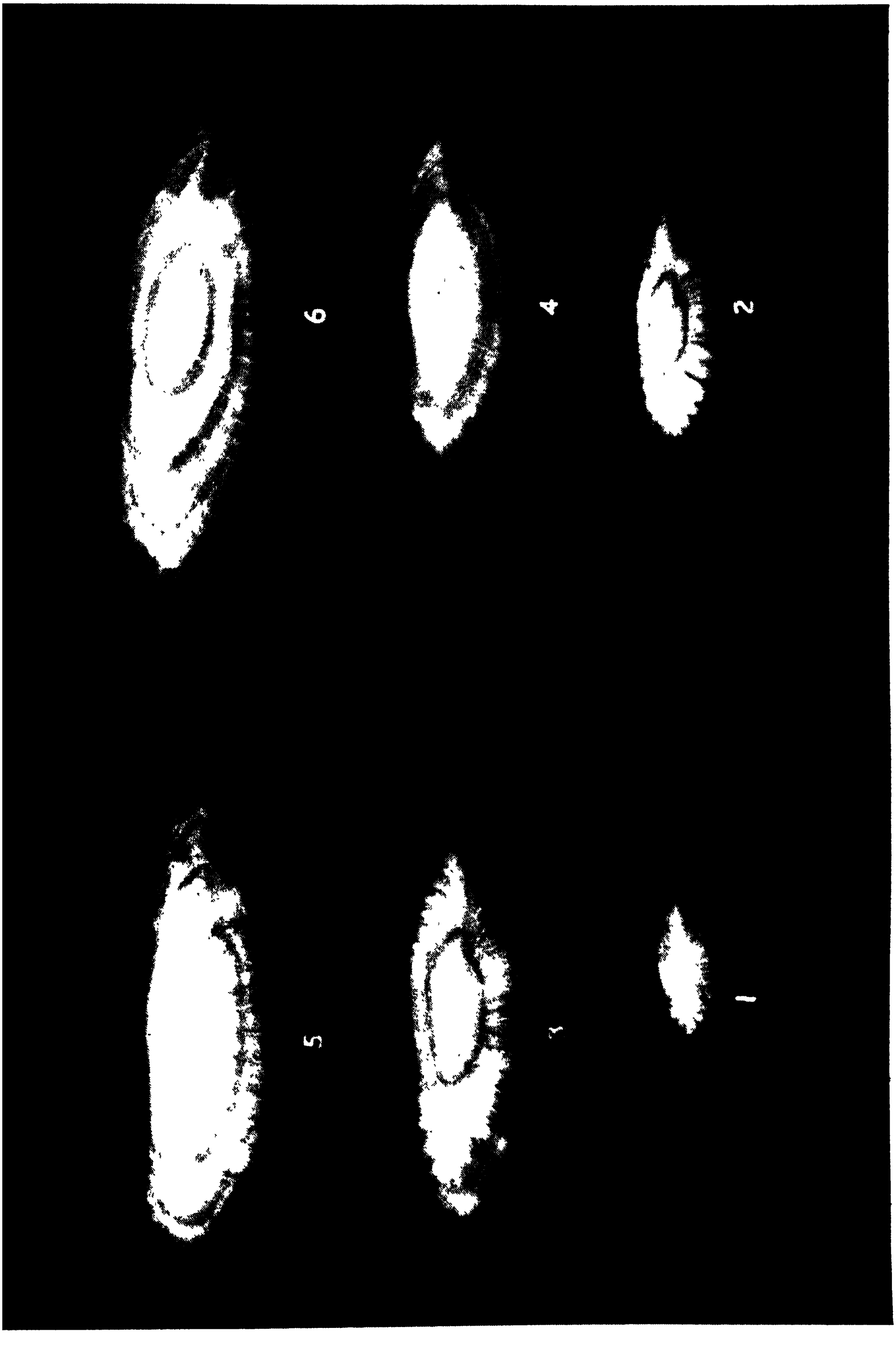


Fig. b


AGE & GROWTH —— AUSTRALIAN BREAM (ACANTHOPAGRUS AUSTRALIS)
BREAM – SLIGHTLY OVER 4 YEARS OLD
Length = 8 1/4 inches
BREAM SCALE
(Highly Magnified)
AGE & SIZE OF BREAM CALCULATED FROM THE SCALES
1 YEAR OLD
2 3/4 Inches
2 YEAR OLD
4 5/8 Inches
3 YEAR OLD
6 Inches
4 YEAR OLD
7 1/8 Inches
Inches
ISRM del
AP photo
ALL IMMATURE ——
No Eggs are produced or spawned during the first THREE YEARS of growth
MATURE ——
Bream begin to spawn at the end of FOUR YEARS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Tasmanian Araneae of the Family Hahniidae with Notes on their Respiratory Systems

By

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Ralston Professor of Biology, University of Tasmania

(Read 11th November, 1947)

FIGURES 1-28

Spiders belonging to the family Hahniidae are usually small, rarely being more than two or three millimetres in length. Most of them live near the ground in grass tussocks, low shrubs, moss or under stones. A few species are found under the bark of trees.

Members of the family are characterised by having the six spinnerets arranged in a single transverse row. The tracheal spiracle is somewhat in advance of the spinnerets, and the tracheal system extends into the cephalothorax. In some cases, more than three hundred fine tubules pass through the narrow petiolus, which joins the abdomen to the cephalothorax. The chelicerae lack lateral condyles. The margins of the cheliceral furrow are oblique and provided with teeth. The labium is free. Maxillae are converging and furnished with a scopula. The sternum is shield-shaped, about as wide as it is long and broadly truncated in front. In some exotic species a stridulating apparatus is present. This consists of two groups of short spines on the front of the abdomen, which rub against a roughened area on the posterior part of the carapace. The legs are provided with three tarsal claws, but are without scopulae and claw-tufts. Trichobothria are present on tibiae, metatarsi, and tarsi.

Little is known of the habits of the members of this family. Some of the species spin delicate sheet webs, which are suspended in shallow depressions in the ground. *Scotopsilus bicolor* Simon makes a small sheet web under the loose bark on eucalypts. The spider rests on the upper surface of the web, which is not provided with a retreat.

In spite of the fact that members of the Hahniidae are not uncommon, very few seem to have been recorded from either Australia or New Zealand. Those described from these regions are as follows:—

Scotopsilus bicolor Simon (1886, p. LXI) from Tasmania.
Scotopsilus sp. Simon (1909, p. 181) from West Australia.
Nannonymphaeus pusillus Rainbow (1920, p. 259) from Lord Howe Island.
Neoaviola insolens Butler (1929, p. 45) from Victoria.
Hahnia solitaria Bryant (1935, p. 80) from New Zealand.

The present paper deals with four Tasmanian species, three of which are new. Some features of the respiratory systems of three of the species are given in brief notes as an appendix to the paper.

Family HAHNIIDAE

Genus **Hahnia** C. Koch, 1841

Hahnia astrolomae, sp. n.

(Figs 1-7)

Male

	mm.
Total length	1·564
Length of carapace	0·812
Width of carapace	0·580
Length of abdomen	0·928
Width of abdomen	0·696

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	0·726	0·247	0·644	0·479	0·356	2·452
2	0·617	0·233	0·493	0·397	0·329	2·069
3	0·617	0·206	0·329	0·329	0·288	1·769
4	0·589	0·206	0·452	0·397	0·315	1·959
Palp	0·315	0·164	0·137	...	0·206	0·822

Colour. Carapace, chelicerae, maxillae, labium and sternum brown. Front and sides of abdomen dark-grey. Dorsal surface cream with a dark-grey triangular patch on anterior half and four dark-grey chevrons, incomplete in mid line, on posterior half. Ventral surface cream in the middle merging into dark-grey speckled with cream spots at the sides. Coxae cream. First pair of legs and palpi brown. Other legs cream ringed with brown on metatarsi, tibiae, patellae and distal part of femora.

Carapace. Widest between second and third coxae. Thoracic groove longitudinal. Radial grooves distinct. An irregular longitudinal row of about eight hairs extends from the front of the thoracic groove to the eye-group.

Eyes. The eight eyes are arranged in two rows. Viewed from above the front row is slightly recurved and the posterior row procurved. The eyes are subequal in size. The ratio of the eyes AME : ALE : PME : PLE = 13 : 12 : 11 : 11. AME are mounted on a small black tubercle and are separated from each other by 6/13 of their diameter and from ALE by 4/13 of their diameter. The lateral eyes are contiguous. PME are separated from each other by 19/11 of their diameter and from PLE by 9/11 of their diameter. The median ocular quadrangle is wider behind than in front in ratio 37 : 31. Its length is shorter than its posterior width in ratio 32 : 37. The distance from AME to margin of clypeus is 20/13 of the diameter of AME. There is a single seta in front of AME and one on each side of clypeus.

Chelicerae. Vertical. Condyles absent. Fang moderately long. Two teeth are present on promargin and two on the retromargin. A light scopula of five or six barbed hairs is situated on the promargin (fig. 1).

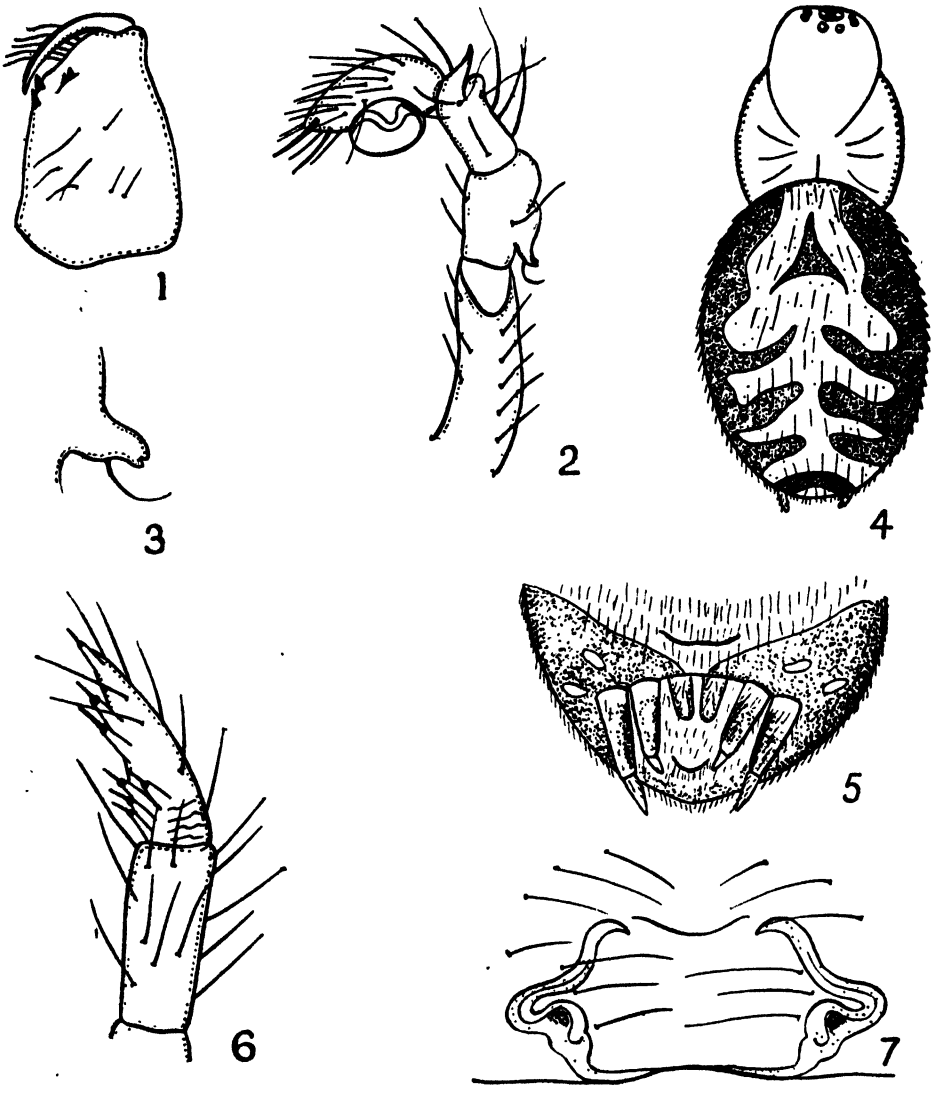
Maxillae. Somewhat rectangular, slightly converging, a light scopula on inner apical angle. The front margin is slightly curved and provided with a serrula which does not extend onto the side.

Labium. Wider than long in ratio 23 : 19. Rounded in front and clothed with a few long hairs.

Sternum. Longer than wide in ratio 26 : 25, convex, shield-shaped, lightly clothed with long hairs. Fourth coxae separated by about 2/3 of their width.

Legs. 1.2.4.3. Lightly clothed with finely barbed hairs. Two trichobothria on each tarsus, two on the apical half of each metatarsus and five on each tibia. Scopulae and claw-tufts absent. Three tarsal claws, the lower claw with two

teeth, the upper claws with about five teeth. A small 'drum' is present on the dorsal surface of each tarsus in the distal quarter. The first two pairs of legs have one prolateral spine near the apex of the femora and one ventral spine near the apex of the metatarsi. The last two pairs of legs have one dorsal spine at the apex of the patellae, 1 - 1 on the dorsal side of the tibiae, and 1 prolateral, 1 ventral and 1 retrolateral at the apex of the metatarsi. Elsewhere on the legs spines are absent.



FIGS 1-7.

Hahnia astrolomae, sp. n. Fig. 1: Retrolateral view of left chelicera of male. Fig. 2: Left palpus of male. Fig. 3: Apophysis on patella of male palpus. Fig. 4: Dorsal view of female. Fig. 5: Spinnerets of female. Fig. 6: Hind spinneret of female. Fig 7: Epigynum of female.

Palpi. On the retrolateral side of the patella near the base is a short blunt tooth-like apophysis provided with a single curved hair (figs. 2 and 3). On the dorsal side at the apex is a long stout bristle. The tibia, which is nearly as long as the patella, has a stout bristle and four trichobothria on its dorsal side. On the retrolateral side at the apex the tibia is produced into a short curved apophysis. The tarsus is small and spoon-shaped. On its retrolateral margin it is furnished with four spine-like setae.

Abdomen. Ovoid, clothed with long coarse hairs on the dorsal surface and finer hairs on the ventral surface. The spinnerets are aranged in a transverse row. The apical segment of the hind spinnerets is 7/8 the length of the basal segment. The fore spinnerets are longer than the basal segment of the hind spinnerets in ratio 15 : 11. The middle spinnerets are about 7/11 as long as the fore spinnerets. The apical segment of the hind spinnerets has about seven spinning tubes. The fore spinnerets have one large and two very small tubes, and the middle spinnerets have four tubes. The tracheal spiracle is situated a short distance in front of the spinnerets.

Female

	mm.
Total length	1·624
Length of carapace	0·696
Width of carapace	0·580
Length of abdomen	1·044
Width of abdomen	0·754

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	0·507	0·206	0·356	0·288	0·288	1·645
2	0·466	0·206	0·301	0·274	0·288	1·535
3	0·397	0·178	0·274	0·247	0·233	1·329
4	0·521	0·192	0·370	0·315	0·288	1·686
Palp	0·206	0·123	0·151		0·192	0·672

Colour. As in the male but the dorsal surface of the abdomen shows a larger area of cream and not so much dark grey. The four chevrons are more pronounced (fig. 4).

The form of the carapace, eyes, chelicerae, maxillae, labium and sternum as in the male.

Legs. 4.1.2.3. The two front pairs of legs are much shorter than those of the male. Trichobothria and spines are arranged as in the male. The superior tarsal claws are similar and provided with seven teeth, which decrease in length towards the base of the claws. Inferior claw with two teeth. A 'drum' is present on the dorsal side of each tarsus in the distal quarter of the segment as in the male.

Palpi. Tarsus slightly longer than tibia, clothed with a number of coarse setae. Tibia has four trichobothria, but 'drum' and trichobothria are absent from the tarsus. The tarsal claw is slightly curved and provided with three small teeth.

Abdomen. Ovoid. Spinnerets in a transverse row (fig. 5). Middle spinnerets with six spinning tubes. Fore spinnerets with one large and two small tubes. The apical segment of the hind spinnerets about equal in length to the basal segment and provided with seven spinning tubes (fig. 6).

Epigynum. The form of the epigynum as seen in transparent preparations is shown in fig. 7.

Locality. The type specimens were collected in small recumbent shrubs, especially in *Astroloma humifusum*, on the Domain, Hobart, 24th August, 1942. The spider is quite common. It also occurs at Risdon and at the Punch Bowl, Launceston.

Hahnia ampullaria, sp. n.

(Figs 8-14)

Male

	mm.
Total length	1·682
Length of carapace	0·754
Width of carapace	0·696
Length of abdomen	1·044
Width of abdomen	0·750

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	0·822	0·288	0·726	0·589	0·493	2·918
2	0·685	0·260	0·603	0·493	0·466	2·507
3	0·548	0·233	0·452	0·438	0·411	2·082
4	0·685	0·233	0·617	0·548	0·480	2·563
Palp	0·274	0·206	0·110		0·329	0·919

Colour. Carapace dull yellow with a dark-grey patch in the middle and four dark-grey patches on each side. The eye-group is set in black pigment. Legs, chelicerae, palpi, maxillae and labium dull yellow. Sternum yellowish with dark-grey margin. Dorsal surface of abdomen light yellow with dark-grey markings. Ventral surface of abdomen light yellow with dark-grey areas in the middle and in front of the spinnerets. The spinnerets are light yellow.

Carapace. Widest between second coxae. Thoracic groove longitudinal. A median row of four or five long hairs on the dark area in front of the groove.

Eyes. The eight eyes are arranged in two rows. Viewed from above the first row is slightly recurved and the second row slightly procurved. AME dark, the other eyes pearly white. Ratio of eyes AME : ALE : PME : PLE = 11 : 20 : 17 : 17. Laterals contiguous. AME almost contiguous with ALE but separated from each other by 5/11 of their diameter. PME separated from each other by 15/17 of their diameter and from PLE by 3/17 of their diameter. The median ocular quadrangle wider behind than in front in ratio 48 : 26. The length of the quadrangle is less than its width behind in ratio 35 : 48. Height of clypeus in front of AME is almost three times the diameter of AME.

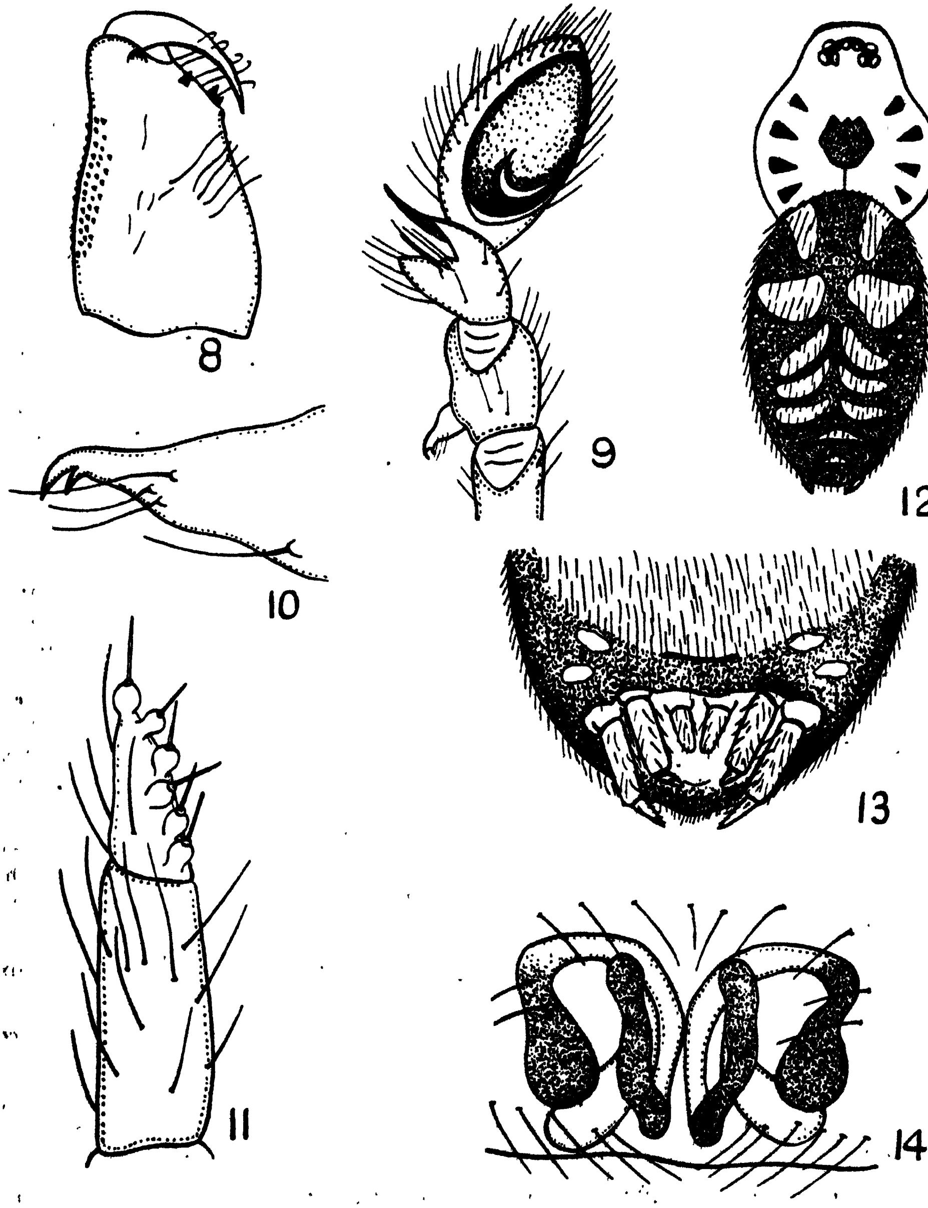
Chelicerae. Vertical, conical, devoid of lateral condyles. Outer surface of paturon coarsely granular. Furrow oblique. Retromargin provided with one tooth, the promargin with two teeth (fig. 8). A light scopula of five or six barbed hairs along promargin.

Maxillae. Converging. A light scopula at inner apical angle. Front margin rounded and provided with a serrula.

Labium. Wider than long in ratio 39 : 25. Rounded in front and fringed with a few long hairs.

Sternum. Shield-shaped, convex, longer than wide in ratio 30 : 29. Clothed with a few long hairs, which are more numerous round the margin than in the centre. The fourth coxae are separated by about once their diameter.

Legs. 1.4.2.3. Lightly clothed with long finely barbed hairs. Two trichobothria on each tarsus, two on the apical half of each metatarsus and six on each tibia. A small 'drum' is present on the dorsal side of each tarsus in the apical quarter. Scopulae and claw-tufts absent. Three tarsal claws, the upper claws similar with



FIGS 8-14.

Hahnia ampullaria, sp. n. Fig. 8: Retrolateral view of right chelicera of male. Fig. 9: Right palpus of male. Fig. 10: Apophysis on patella of male palpus. Fig. 11: Hind spinneret of male. Fig. 12: Dorsal view of female. Fig. 13: Spinnerets of female. Fig. 14: Epigynum of female.

six teeth, the lower claw with two teeth. No spines are present on any of the segments. The hairs on the ventral surface of the femora are longer and coarser than elsewhere.

Palpi. Tarsus spoon-shaped. Tibia short and produced into a long sharp apophysis as shown in fig. 9. Near the base of the apophysis is a small tubercle bearing a group of five setae. There are four trichobothria on the dorsal side of the tibia. The patella is nearly twice the length of the tibia and is provided with a hook-like apophysis on the retrolateral side near the base. The apophysis has a tooth near the hook-like end and is provided with three setae (fig. 10).

Abdomen. Ovoid, clothed with long hairs. Spinnerets in a transverse row. Apical segment of the hind spinnerets slightly shorter than the basal segment, and provided with six spinning tubes, which have the form of small bulbs or ampullae (fig. 11). The fore spinnerets are longer than the basal segment of the hind spinnerets in ratio 3 : 2. Each is provided with one large and one small bulbous spinning tube on the small conical segment at the apex. The middle spinnerets are shorter than the basal segment of the hind spinnerets and are furnished with four bulbous spinning tubes. The tracheal spiracle is a short distance in front of the spinnerets.

Female

	mm.
Total length	1·740
Length of carapace	0·812
Width of carapace	0·638
Length of abdomen	1·160
Width of abdomen	0·812

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	0·699	0·247	0·589	0·493	0·466	2·494
2	0·617	0·247	0·507	0·425	0·438	2·234
3	0·548	0·219	0·411	0·411	0·384	1·973
4	0·671	0·247	0·575	0·548	0·452	2·493
Palp	0·233	0·137	0·205		0·274	0·849

The female resembles the male in coloration and markings (fig. 12). Only the following features need be described.

Legs. 1.4.2.3. The first and fourth pairs are almost equal in length. Trichobothria, spines and tarsal 'drum' are present as in the male.

Palpi. The tarsal segment is clothed with hairs and stiff bristles but lacks trichobothria and a 'drum'. The tarsal claw is almost straight and has one small tooth. The tibia is slightly shorter than the tarsus and is provided with four trichobothria.

Abdomen. Ovoid. Spinnerets as in the male (fig. 13), but the spinning tubes on the apical segment of the hind spinnerets are more numerous.

Epigynum. The form of the epigynum as seen in transparent preparations is shown in fig. 14.

Locality. The type specimens were collected on the Domain, Hobart, 20th August, 1947. This spider is found on the under side of stones, especially on those lying amongst the debris at the foot of Casuarina trees.

Genus **Neoaviola** Butler, 1929

Neoaviela wellingtoni, sp. n.

(Figs 15-21)

Male

	mm.
Total length	1·276
Length of carapace	0·638
Width of carapace	0·522
Length of abdomen	0·754
Width of abdomen	0·580

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	0·466	0·192	0·329	0·288	0·329	1·604
2	0·452	0·178	0·301	0·274	0·329	1·534
3	0·411	0·178	0·274	0·274	0·315	1·452
4	0·507	0·178	0·411	0·384	0·369	1·849
Palp	0·178	0·150	0·082		0·233	0·643

Colour. Carapace light drown marked with a dark brown area in front of the thoracic groove, a dark brown margin and four triangular brown patches on each side (fig. 15). Legs brown but lighter in colour on basal half of femora. Palpi, chelicerae and labium yellowish. Sternum light brown in the centre, darker at the sides. Maxillae and coxae dull yellow. Abdomen above and at the sides very dark-grey, nearly black. The dorsal surface ornamented with a pair of yellowish spots on anterior half and six thin yellowish chevrons on posterior half, These markings on both carapace and abdomen are not constant and in some specimens the dark brown markings on the carapace are very faint or absent.

Carapace. Widest between second and third coxae. Thoracic groove longitudinal. Radial grooves distinct. An irregular double row of hairs is situated in a median longitudinal line between thoracic groove and eyes.

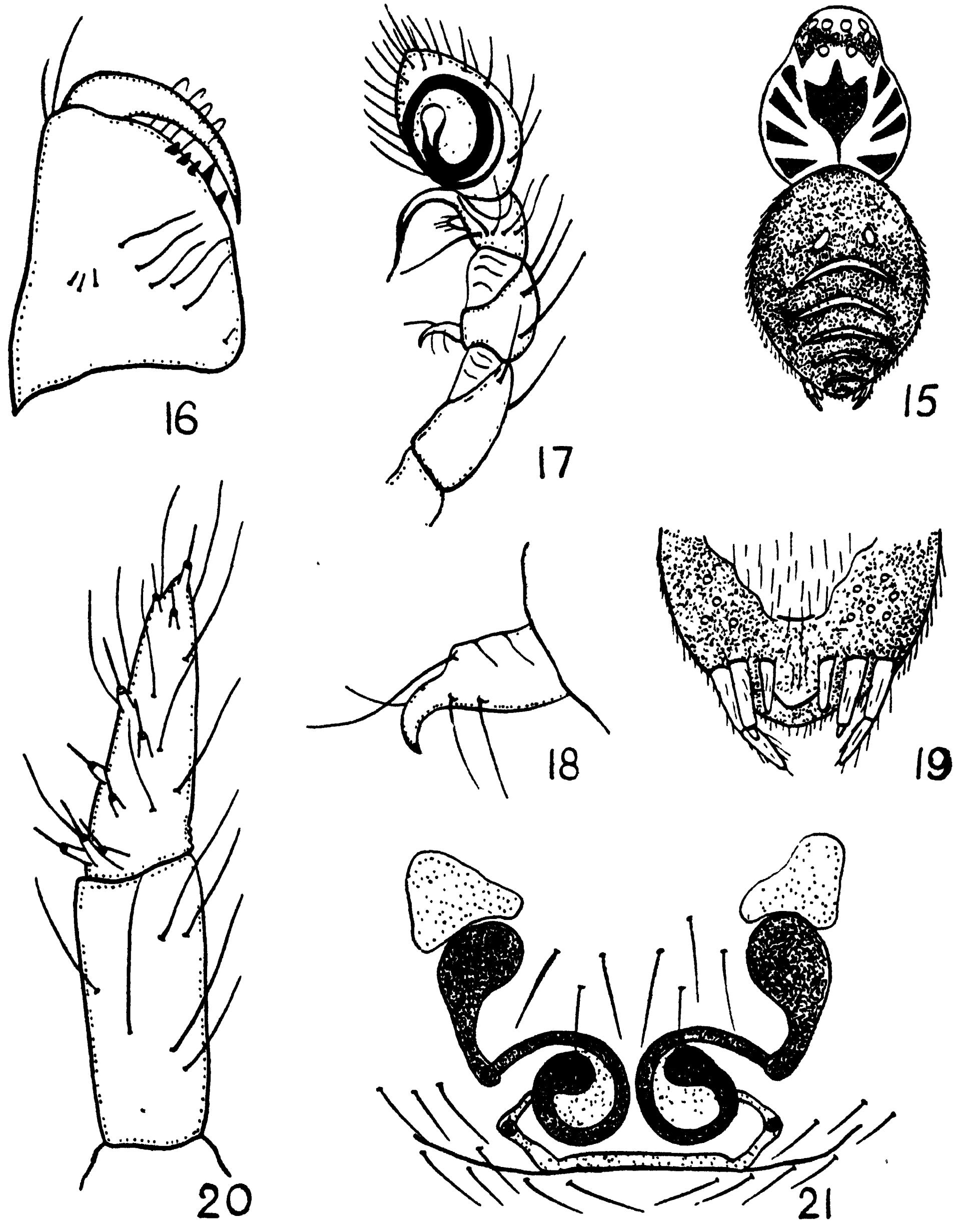
Eyes. The eight eyes are arranged in two rows. Viewed from above the front row is slightly procurved and the hind row distinctly procurved. AME dark, other eyes pearly white. The eye-group occupies almost the full width of the head. Ratio of eyes AME : ALE : PME : PLE = 13 : 14 : 14 : 17. The laterals are contiguous. AME are almost contiguous with ALE but are separated from each other by 4/13 of their diameter. PME are separated from each other by 15/14 of their diameter and from PLE by 9/14 of their diameter. The median ocular quadrangle is wider behind than in front in ratio 44 : 31, and is shorter than its posterior width in ratio 38 : 44. The height of the clypeus is 20/13 of the diameter of AME.

Chelicerae. Vertical, clothed with a few long hairs in front. Lateral condyles absent. Fang moderately curved. Furrow oblique with three small teeth on the retromargin and one large and one small tooth on the promargin (fig. 16). There is a light scopula of six or seven barbed hairs on the promargin.

Maxillae. Short, broad and convex. Slightly converging, anterior margin with a well developed serrula. The inner anterior angle is furnished with a slight scopula.

Labium. Wider than long in ratio 3 : 2. Rounded in front and fringed with a few long hairs.

Sternum. Shield-shaped, longer than wide in ratio 12 : 11. Convex, truncate between the fourth coxae, which are separated by about once their diameter. Surface clothed with a few long hairs.



FIGS 15-21.

Neoaviola wellingtoni, sp. n. Fig. 15: Dorsal view of male. Fig. 16: Retrolateral view of right chelicera of male. Fig. 17: Ventral view of right palpus of male. Fig. 18: Apophysis on patella of male palp. Fig. 19: Spinnerets of male. Fig. 20: Hind spinneret of male. Fig. 21: Epigynum of female.

Legs. 4.1.2.3. Lightly clothed with long hairs. Two trichobothria on basal half of each tarsus, two on each metatarsus and five on each tibia. A 'drum' is present on the dorsal side of each tarsus in the apical quarter. Scopulae and claw-tufts absent. Three tarsal claws present. Upper claws similar and with a row of six teeth. Lower claw with two teeth. The teeth on the upper claws of the third and fourth tarsi are much smaller than those on the first and second tarsi. There is a slender dorsal spine at the base and apex of each patella. On each tibia there is a slender dorsal spine and a prolateral spine near the base. Elsewhere on the legs spines are absent.

Palpi. Tarsus spoon-shaped. Tibia much shorter than patella and produced into a long curved sharp apophysis on the retrolateral side at the apex (fig. 17). In the normal flexed condition of the appendage the tip of the apophysis is almost in contact with a hook-like projection from the retrolateral side of the patella (fig. 18). There are four trichobothria on the tibia.

Abdomen. Ovoid, clothed with barbed hairs. Tracheal spiracle a short distance in front of spinnerets. The six spinnerets are in a transverse row (fig. 19). The middle pair are separated from each other by little more than once their diameter. They are slightly shorter than the basal segment of the fore spinnerets and are provided with six spinning tubes. The apical segment of the fore spinnerets is small and conical. It is provided with one spinning tube. The hind spinnerets are nearly twice the length of the fore spinnerets. The apical segment of the hind spinnerets is longer than the basal segment in ratio 10 : 7 and is provided with ten spinning tubes (fig. 20).

Female

	mm.
Total length	1·624
Length of carapace	0·638
Width of carapace	0·580
Length of abdomen	0·928
Width of abdomen	0·812

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	0·521	0·219	0·343	0·315	0·343	1·741
2	0·493	0·219	0·343	0·328	0·343	1·726
3	0·466	0·206	0·301	0·315	0·343	1·631
4	0·603	0·206	0·493	0·424	0·411	2·137
Palp	0·219	0·123	0·164		0·247	0·753

The female is somewhat lighter in coloration than the male but otherwise resembles it in appearance and only the following characters need be described.

Palpi. There are four trichobothria on the tibia but none on the tarsus. A tarsal 'drum' is also lacking. The claw is almost straight and appears to lack teeth. Spines are present and arranged as follows. Patella: dorsal 1 - 1. Tibia: dorsal 1. Tarsus: dorsal 1 - 1, prolateral 1 - 1, ventral 1 - 1. Elsewhere 0.

Epigynum. The form of the epigynum as seen in transparent preparations is shown in fig. 21.

Spinnerets. Arranged in a transverse row as in the male. The middle spinnerets are 2/3 the length of the fore spinnerets and are furnished with eight spinning tubes. The fore spinnerets are about half as long as the hind spinnerets and have a short apical segment carrying three spinning tubes. The hind spinnerets are long and slender, the apical segment being nearly twice as long as the basal segment and bearing 12 spinning tubes.

Locality. The type specimens were collected on Mount Wellington, 19th December, 1944. The spiders were found in moss.

Genus **Scotopsilus** Simon, 1886

Scotopsilus bicolor Simon

(Figs 22-26)

This species is the type of the genus and was described by Simon (1886, p. LXI) from a female specimen taken at Launceston. The description is very brief and is not illustrated. However, in a later publication Simon (1898, p. 271) gave a figure of the spinnerets.

The following account deals with the hitherto unknown male and gives some additional notes on the female.

Male

	mm.
Total length	4·176
Length of carapace	1·856
Width of carapace	1·566
Length of abdomen	2·494
Width of abdomen	1·972

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	1·276	0·580	1·102	0·928	0·696	4·582
2	1·160	0·580	1·044	0·928	0·638	4·350
3	1·044	0·464	0·870	0·986	0·638	4·002
4	1·334	0·580	1·160	1·160	0·754	4·988
Palp	0·522	0·348	0·174		0·464	1·508

There are considerable variations in size, some mature specimens being little more than half the size of the specimen selected for description.

Colour. Carapace, legs, maxillae and sternum golden yellow. Clypeus, chelicerae and sides of head brown. Black pigment between the eyes. Palpi brownish yellow. Abdomen black above and at the sides, lighter underneath. Specimens preserved in alcohol show the black dorsal surface of the abdomen speckled with small grey dots, which tend to be arranged in oblique rows at the sides and to form five indistinct chevrons on the posterior half of dorsal surface.

Carapace. Widest between second coxae. Thoracic groove longitudinal. Radial grooves distinct. A group of about eleven hairs in front of thoracic groove and a median row of hairs leading forward to the eyes. A few short hairs on the dorsal surface of the head. Thoracic region of the carapace smooth and without hairs.

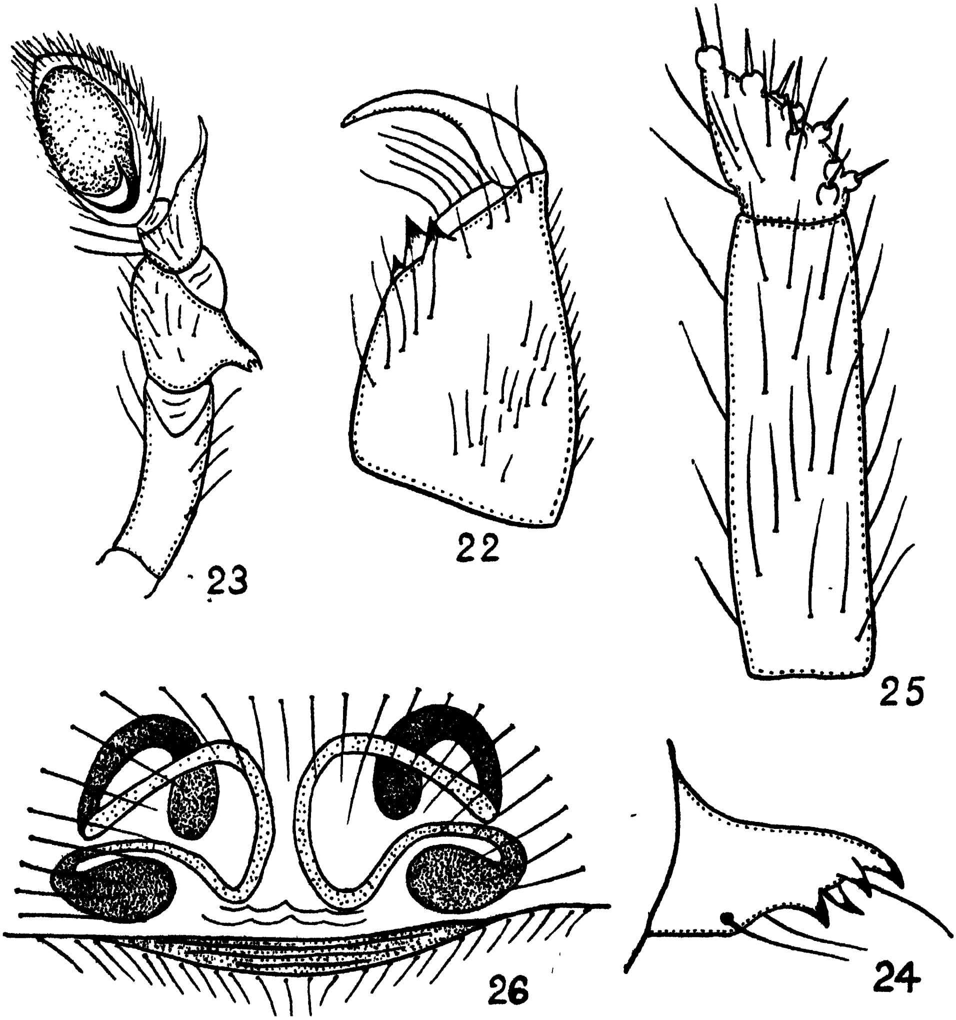
Eyes. The eight eyes are arranged in two rows. Viewed from above the front row appears slightly recurved and the hind row distinctly procurved. The eye-group is shorter than the width of the head in ratio 5 : 8. AME are the smallest of the group. The ratio of the eyes AME : ALE : PME : PLE = 5 : 10 : 7 : 9. AME are separated from each other by 2/5 of their diameter and from ALE by the same distance. Lateral eyes almost contiguous. PME separated from each other by 8/7 of their diameter and from PLE by 5/7 of their diameter. Median ocular quadrangle wider behind than in front in ratio 22 : 12. The posterior width is greater than the length in ratio 22 : 18. The height of the clypeus below AME is 9/5 of the diameter of AME. The margin of the clypeus is fringed with about ten long hairs.

Chelicerae. Conical and vertical. Clothed with a few stiff hairs in front. Lateral condyles absent. Fang moderately long and curved. Furrow oblique. Promargin with a light scopula and one large and one small tooth. Retromargin with a single large tooth (fig. 22).

Maxillae. Broad, rectangular, somewhat converging and slightly depressed in the middle. A small scopula on the inner anterior angle. Serrula confined to front margin and not extending onto side.

Labium. Wider than long in ratio 6 : 5. Truncate in front and fringed with a few hairs. Depressed in the middle. Extending forward for more than half the length of the maxillae.

Sternum. Shield-shaped. Longer than wide in ratio 20 : 18. Clothed with short black hairs, which are more numerous at the sides than at the centre. Posterior coxae separated by slightly more than their diameter.



FIGS 22-26.

Scotopsilus bicolor Simon. Fig. 22: Retrolateral view of left chelicera of male. Fig. 23: Ventral view of left palpus of male. Fig. 24: Apophysis on patella of male palp. Fig. 25: Right hind spinneret with apical segment extended. Fig. 26: Epigynum of female.

Legs. 4.2.1.3. Clothed with black hairs which are more numerous on the sides of the tibiae, metatarsi and tarsi than elsewhere. True spines are absent, but there is a short dorsal bristle at the apex of each patella and one near the base of each tibia. There are two trichobothria and a 'drum' on the apical half of each tarsus, two trichobothria towards the apex of each metatarsus and five in two rows on each tibia. Three tarsal claws are present. The upper claws similar and with about nine teeth. Lower claw with two teeth. Scopulae and claw-tufts absent.

Palpi. Tarsal segment spoon-shaped. Tibia very short and produced into a long sharp curved apophysis on the retrolateral side at the apex. Patella is twice the length of the tibia and, on the retrolateral side, is produced into a short stout apophysis which has four curved teeth at the apex and is furnished with several setae (figs 23 and 24). There are four trichobothria on the tibia.

Abdomen. Ovoid, clothed with black hairs. Tracheal spiracle a short distance in front of the spinnerets. The spinnerets are cylindrical and arranged in a slightly curved transverse row, the hind spinnerets being external to and slightly above the fore spinnerets. The apical segment of the hind spinnerets is very short, being only 2/5 of the length of the basal segment. It is furnished with nine short bulbous spinning tubes, and in the living spider, is turned inwards (fig. 25). The fore spinnerets are slightly shorter than the basal segment of the hind spinnerets and are provided with two bulbous spinning tubes at the apex. The middle spinnerets are about 2/3 the length of the fore spinnerets and are furnished with about twelve bulbous spinning tubes.

Female

	mm.
Total length	3·190
Length of carapace	1·392
Width of carapace	1·102
Length of abdomen	2·030
Width of abdomen	1·566

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	1·044	0·406	0·870	0·754	0·580	3·654
2	0·986	0·406	0·812	0·696	0·580	3·480
3	0·870	0·348	0·754	0·754	0·522	3·248
4	1·044	0·406	0·928	0·928	0·580	3·886
Palp	0·406	0·174	0·290		0·348	1·218

The female resembles the male in coloration and in the form of the carapace, eyes, chelicerae, maxillae, labium, sternum and legs.

Palpi. The tarsal claw is almost straight and devoid of teeth. The tarsus is clothed with barbed hairs and stout spine-like setae, but lacks trichobothria and a 'drum'. The tibia is furnished with four trichobothria and several stout setae.

Abdomen. Ovoid. The spinnerets are cylindrical and arranged as in the male but their relative lengths differ from those of the male. The apical segment of the hind spinnerets is a little less than half the length of the basal segment and is furnished with eleven bulbous spinning tubes, one near the base being much larger than the others. The fore spinnerets are slightly longer than the basal segment of the hind spinnerets in ratio 25 : 22, and are provided with four bulbous spinning tubes at the apex. The middle spinnerets are 3/5 of the length of the fore spinnerets and are furnished with about twelve spinning tubes. The distance of the tracheal spiracle from the base of the spinnerets is equal to about 1/3 of the distance from the base of the spinnerets to the epigastric furrow.

Epigynum. The form of the epigynum as seen in transparent preparations is shown in fig. 26.

Locality. The allotype male was collected at Risdon during January. The spider lives under the loose bark on eucalypts, and is widely distributed throughout the State. It has been collected at Trevallyn, The Cascades, Fern Tree and elsewhere. Specimens kept in the laboratory spun small sheet webs.

APPENDIX

NOTES ON THE RESPIRATORY SYSTEMS OF SCOTOPSILUS, HAHNIA AND NEOAVIOLA (FIGS 27 AND 28)

In *Scotopsilus bicolor* Simon the tracheal spiracle opens into a wide atrium, which gives off two stout trunks. These pass forward for a short distance and then each divides into a short outer branch and a slightly longer inner branch (fig. 27). The inner branches lie between the longitudinal muscle bands, whilst the outer branches lie outside them. Each inner branch divides to form a bundle of about 150 tracheal tubes and each outer branch divides to form a bundle of 26 tracheal tubes. The two inner bundles pass forward to the petiolus. The two outer bundles pass forward on the outer side of the dorso-ventral muscles and genital ducts until in line with the book-lungs. Here they bend inwards towards the petiolus. The tubes of the four bundles now come together and pass through the petiolus into the cephalothorax. In the petiolus they lie below the gut (fig. 28), the tubes from the outer bundles being above those from the inner bundles. There is a noticeable difference in the size of the tubes forming the inner and outer bundles. The average diameter of those forming the outer bundles is about 8 micra, whilst that of those composing the inner bundles is about 5 micra. The total number of tubes entering the cephalothorax is about 312. This number includes nearly all the tubes from the two outer bundles and most of those from the two inner bundles, very few supplying the abdomen. The two book-lungs are in the usual position. Each has about 13 leaves.

The respiratory systems of *Hahnia astrolomae* sp. n. and *Neoaviola wellingtoni* sp. n. resemble that of *Scotopsilus bicolor.* The tracheal spiracle leads into a wide atrium, which gives off two trunks. These divide into inner and outer branches from which tracheal tubes arise and pass forward to the petiolus. In the case of *Hahnia astrolomae* the outer branches each give rise to about 25 tubes having an average diameter of 5 micra, whilst the inner branches each give rise to about 35 tubes having an average diameter of 3 micra. About 113 tubes pass through the petiolus into the cephalothorax. The book-lungs have six leaves.

In *Neoaviola wellingtoni* each inner bundle is made up of 19 tubes having an average diameter of 4 micra. Each outer bundle is composed of 13 tubes having an average diameter of 5 micra. About 55 tubes pass into the cephalothorax. The book-lungs have four leaves.

Acknowledgments are made to the Trustees of the John Ralston Bequest under whose auspices the above work was carried out.

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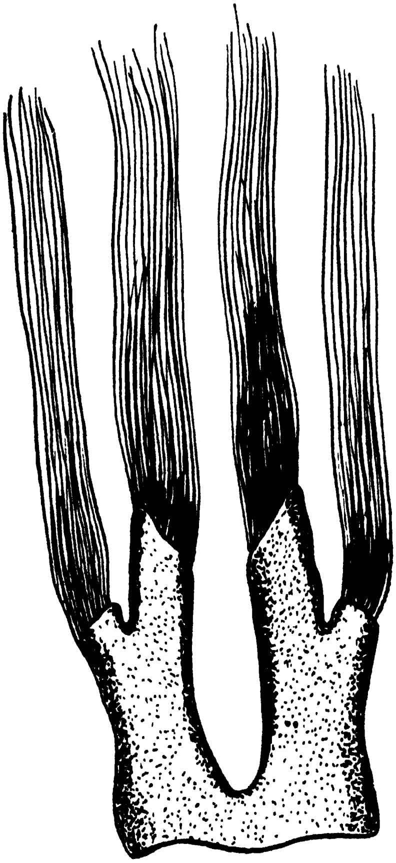

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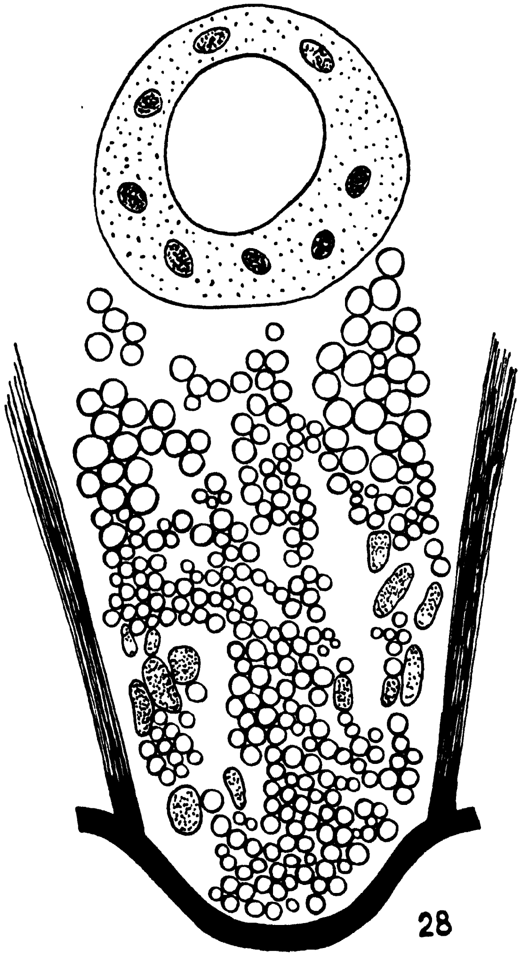

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FIGS 27-28.

Scotopsilus bicolor Simon. Fig. 27: Atrium and tracheal trunks giving rise to the inner and outer bundles of tracheal tubes. Fig. 28: Transverse section through the petiolus showing the large number of tracheal tubes below the gut.

PAP. AND PROC. ROY. SOC. TASMANIA, 1947 (1ST AUGUST, 1948)

The Taxonomic Position of Idiogarypus Hansenii (With)

By

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Demonstrator in Zoology, University of Tasmania

(Read 11th November, 1947)

PLATE IV

The original description of *Garypus hansenii* was based on a single male specimen which had been collected in Tasmania by Mr. Peckham. The exact part of the island from which it was obtained is not mentioned. It was deposited in the British Museum, and from here it was eventually sent with several other pseudoscorpions to be studied by C. J. With. His description of it was published in 1908. Chamberlin in 1930 made a note on the possible generic position of this pseudoscorpion, which he at that time placed in the genus *Garypus* of the sub-family Garypinae. The next mention of this form is to be found in Beier's work on the Pseudoscorpionidea in Das Tierreich (1932) where it was placed in the genus *Maorigarypus*. However, in 1943 *Maorigarypus* was reduced by Chamberlin to sub-generic rank in the genus *Synsphyronus*. In the same paper (1943), a new genus *Idiogarypus* was erected for the pseudoscorpion under consideration. Chamberlin noted that it was closely related to *Synsphyronus*, but based the establishment of the new genus on three main points, viz.:—

(1) There are only seven tactile setae on the fixed finger of the chela.
(2) The position of the galeal seta is much caudad of the terminal attachment of the serrula exterior.
(3) The small eyes (eight ocular diameters from the anterior end of the carapace).

Efforts to obtain specimens of *Idiogarypus hansenii* were unsuccessful, but it was found that the most commonly occurring pseudoscorpion near Hobart resembled it very closely—even to the proportions of the parts—except in the three points mentioned above which mark off *Idiogarypus* from *Synsphyronus*. Two male specimens of this local type were sent to the British Museum where they were compared by Dr. E. Browning with the orthotype of *Idiogarypus*, and found to be the same species. It appears that the original description by With was not accurate in the three points enumerated above. As the differences between *Synsphyronus* and *Idiogarypus* mentioned by Chamberlin are therefore non-existent, the true systematic position of this pseudoscorpion is in the sub-genus *Maorigarypus* Chamberlin of the genus *Synsphyronus* Chamberlin.

A redescription of this species follows, and is based on a female and a male (homeotypes) which were collected at Risdon, near Hobart, in June, 1947. The specimens were boiled in 10 per cent KOH solution, and after clearing, mounted in Canada Balsam.

Synsphyronus (Maorigarypus) hansenii (With)

All the following measurements are in millimetres, and have been made in the way Chamberlin describes (1931, p. 24). Length always precedes breadth, and measurements of the segments of the palpi and legs are given in the order, trochanter, basifemur, telofemur, both femoral segments together, tibia and tarsus (both tarsal segments are measured together as a miotarsus). The length of the trochanter of the palpus is measured from the proximal edge of the pedicle to the anterior distal edge which articulates with the femur. All measurements exclude the pseudoderm.

Female

Length 4·351. *Breadth of abdomen (6th tergite)* 2·052.

Carapace 1·090-1·292, *Cucullus* 0·300, *Ocular breadth* 0·627.

Palpus—(0·475-0·355), (1·349-0·304), (0·950-0·332), *chela* (1·881), *hand* (0·912-0·446-*depth* 0·380), *fingers* 0·941.

Leg I—(0·290-0·190), (0·361-0·172), (0·304-0·190), (0·645-0·190), (0·380-0·123), (0·390-0·088).

Leg IV—(0·418-0·200), (0·304-0·180), (0·684-0·218), (0·931-0·218), (0·627-0·133), (0·473-0·105).

Chelicera—0·263-0·174, *mov. finger length* 0·230.

Maxilla—0·580, al. 0·513, b. 0·361, ab. 0·456.

Male

Length 3·857. *Breadth of abdomen (6th tergite)* 1·957.

Carapace 1·017-1·197, *Cucullus* 0·285, *Ocular breadth* 0·608.

Palpus—(0·446-0·323), (1·216-0·275), (0·893-0·306), *chela* (1·710), *hand* (0·836-0·410-*depth* 0·342), *fingers* 0·893.

Leg I—(0·266-0·189), (0·310-0·160), (0·293-0·187), (0·580-0·187), (0·361-0·114), (0·370-0·085).

Leg IV—(0·342-0·205), (0·247-0·171), (0·665-0·209), (0·874-0·209), (0·587-0·150), (0·470-0·100).

Chelicera—0·224-0·159, *mov. finger length* 0·202.

Maxilla—0·500, al. 0·475, b. 0·323, ab. 0·418.

The colour of the living animal is slate-grey, but on preservation in alcohol it becomes a yellowish brown. The whole surface of the chitinised parts is reticulately rugose. The reticulation occurs in a hyaline pseudoderm (which is found in all members of this genus). This may be easily removed from the true derm (e.g., by boiling in KOH solution). If this is done, the reticulate pattern is still retained by the true derm.

The carapace (Plate IV, fig. 2) has the usual garypoid, sub-triangular form, and is broader posteriorly than long. There are no transverse furrows and no longitudinal groove. The anterior margin of the carapace is a little indented in the middle. There are two pairs of eyes, the anterior pairs being elliptical in shape (Plate IV, fig. 2*a*) and situated from 5·3-6·8 ocular diameters from the anterior end of the carapace (these figures are based on measurements of 25 specimens, including three living). There is a short clavate seta between the anterior and posterior eyes of each side. The chaetotaxy and lyrifissures of the carapace are shown in fig. 2. The number of setae on the central disc varies quite considerably. On examining 10 males and 11 females, it was found that the number

of setae varied in the males from 12-17 (average 14), and in the females from 13-22 (average 17). Owing to this variation, care should be taken in using the number of setae on the central disc in taxomony.

The coxal area is of the garypoid type, and has been adequately figured by With (1908, pl. II, fig. 2).

The abdomen is oval, longer than broad. It is broadest at the 6th and 7th segments, which are almost equally broad. The 1st tergite is entire; the 2nd-10th are divided and the 11th is partially so. The setae along the posterior border of the tergites are clavate, but the number on each particular tergum varies from one individual to another. However, a few generalisations based on the examination of 13 females and 11 males may be given. On the average, the adult female has more broader setae than the male. The minimum number for one tergite seems to be four, and the maximum 11. The number on the 1st two tergites, however, ranges from 4-6 in both sexes, on the 3rd tergite from 4-9, and on the 4th-9th from 6-10 (one female had 11 setae on the 6th tergite). The tergites also possess a row of lyrifissures, ranging from 7-21 per tergite. On the ventral surface, the 4th-10th sternites in the male, and the 5th-10th in the female, are divided, and in both sexes the 11th is partially divided anteriorly. The border setae are fewer than on the tergites, and are acute to slenderly clavate. The former kind are found mostly on the anterior segments. The number per sternite varies from 4-8 in males and from 4-10 in females. There is also a row of lyrifissures on each sternite; the number of lyrifissures per sternite varies from 6-18. In the male, the 4th sternite is rather narrower than the other sternites. The anterior genital plate is very much larger than the posterior one. The posterior border of the large plate has a number of acute setae about the genital opening. The anterior portion of the smaller plate has a large number of small lyrifissures in a corresponding position. Both plates are reticulated, although the posterior one is only slightly so. The female genital area (Plate IV, fig. 4) is very pale in contrast to the rest of the sclerotised parts, and is only very slightly reticulated. This pale area takes in the genital plates, and the median part of sternite four (Plate IV, fig. 4). The setae on this area are all acute. The arrangement of these and the lyrifissures is shown in the figure.

The pleural membrane is strongly wrinkled like that of most of the Garypidae.

Chelicerae. These are similar to those of other members of this genus (1943, pl. I, fig. 11). Plate IV, fig. 5, shows the galea and chaetotaxy. The position of the galeal seta (Plate IV, figs 3 and 5, g.s.) is on a level with the terminal attachment of the serrula exterior, and *not* halfway along the movable finger as in With's figure (1908, p. 13, fig. 2). The flagellum consists of one long and two smaller blades (Plate IV, fig. 5*a*). The large blade has two fine 'teeth' about halfway along it, which may easily be overlooked unless the chelicera is lying in the right position. The serrula exterior has about 18 teeth (Plate IV, fig. 3). The lamina exterior is present. The lamina interior possesses a series of about 10 rounded, rather broad teeth. The galeal (g.s.), sub-basal (s.b.) and basal (b.) setae are all much shorter than the laminal (l.s.), interior (i.s.) and exterior (e.s.) setae. The fixed finger has three large sub-median, and two small sub-apical teeth.

Pedipalpus. This has also been figured by With (1908, pl. I, fig. 11 and pl. II, fig. 3). The chela is shown (Plate IV, fig. 1) with the positions of the tactile setae, which are similarly arranged to those of *S. (M.) mimulus* (1943, pl. II, fig. 23). There are eight of these setae on the fixed finger—not seven, as reported by With—and three on the movable finger. There is no sense-spot near the sub-basal (s.b.) seta on the movable finger. Both fingers possess poison

ducts. Each finger possesses a dense row of marginal teeth—there are 56 on the fixed finger, and 43 on the movable finger of the male used in this description. The trochanter (excluding the pedicel) is only a trifle longer than wide; (the rest of the description of the palp is taken from With's paper, 1908, pp. 13-14), 'posteriorly (i.e., on the trochanter) there are two somewhat conical eminences, separated by a deep cleft. The femur, which is about four times as long as broad, has a well marked stalk; the anterior outline has, just beyond the stalk, a low elevation, and is then a little concave, while the posterior is slightly convex. The tibia, which has a rather short, but well marked stalk, is distinctly shorter, but somewhat wider, than the femur, and 2·9 (With's figure is 2·7) times as long as wide; anteriorly it is, just beyond the stalk, slightly convex and then a trifle concave, while the posterior outline is, beyond the well marked basal elevation, straight and then slightly convex. The chela, which is about four times as long as wide, is about 1·3 times as wide as the tibia; the hand is shorter than the tibia, and is a little shorter than the fingers'.

The Legs. These have been figured by With (1908, pl. I, figs 12 and 13). Quoting With once again (1908, p. 14)—'Rather short and clavate hairs are found dorsally, pointed and more or less simple ones ventrally. The arolium extends distinctly beyond the claws. The articulation between the two femoral joints is of the usual structure, with the tooth best developed posteriorly (1908, pl. I, figs 14-15); the basal femoral part is longer but lower than the distal, and almost twice as long as deep. The two tarsal joints of the 1st pair, of which the basal is the longer', are together somewhat longer than the tibia. The femur (taken as a whole) of the fourth pair 'is almost four times as long as deep, as deep as the second tarsal joint is long; the combined tarsi are much shorter than the tibia'. Measuring both tarsal segments as a miotarsus, tarsus I is 4·1-4·4 times, and tarsus IV 4·4-4·7 times as long as deep.

Synsphyronus hansenii has been collected at Hobart and the surrounding parts, and also in the north of the island near Launceston, and in the north-west at the Forth Falls near Sheffield. It may be found under stones, especially between the flakes of broken stones, in grass tussocks and under the bark of gum trees towards the base. Occasionally it is brought in with firewood, and may be found on the walls of sheds or even in the house.

Synsphyronus (M.) hansenii very closely resembles the South Australian form, *S. (M.) mimulus* Chamberlin (1943, p. 496). The Tasmanian form is larger, and, judging from Chamberlin's description, possesses more setae on the average on the central disc and on the abdomen. In *S. mimulus* the chela of the male is 4·2-4·4, of the female 3·5-3·8 times as long as broad. In *S. hansenii* the proportions are similar (about 4·2) in both sexes. The main difference, however, between these two forms is their size (*S. hansenii* varies from about 3·8-4·4 mm. when adult, and *S. mimulus* varies from about 2·2-2·8 mm.).

The homeotypes (one male and one female) on which this re-description is based are to be deposited in the British Museum. Other specimens are to be sent to the Australian Museum, American Museum of Natural History and the Muséum d'Histoire Naturelle, Paris.

I wish to thank Mr. Clarke, Librarian at the University of Tasmania, for obtaining papers for me, and also the various people who have brought specimens to me. I wish to especially thank Professor Hickman for his kind and helpful interest and guidance, and Dr. E. Browning of the Arachnological Section of the British Museum (Natural History), who kindly examined the specimens I sent, and compared them with the orthotype.

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PLATE IV

FIG. 1.—Right chela of male. *t*, terminal; *st*, sub-terminal; *sb*, sub-basal; *et*, exterior terminal; *est*, exterior sub-terminal; *esb*, exterior sub-basal; *eb*, exterior basal; *it*, interior terminal; *ist*, interior sub-terminal; *isb*, interior sub-basal; *ib*, interior basal.

FIG. 2.—Carapace of female, showing chaetotaxy and lyrifissures.

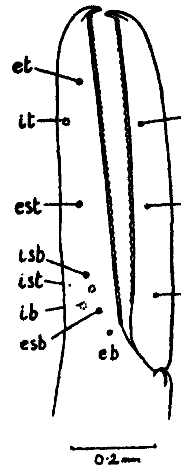
FIG. 2*a*.—Left eyes greatly enlarged.

FIG. 3.—Movable finger of chelicera, showing serrula exterior and the galeal seta (g.s.).

FIG. 4.—Female genital area.

FIG. 5.—Exterior view of chelicera of female. *g.s.* galeal seta; *i.s.* interior seta; *l.s.* laminal seta; *s.b.* sub-basal seta; *e.s.* exterior seta; *b.* basal seta.

FIG. 5*a*.—Flagellum.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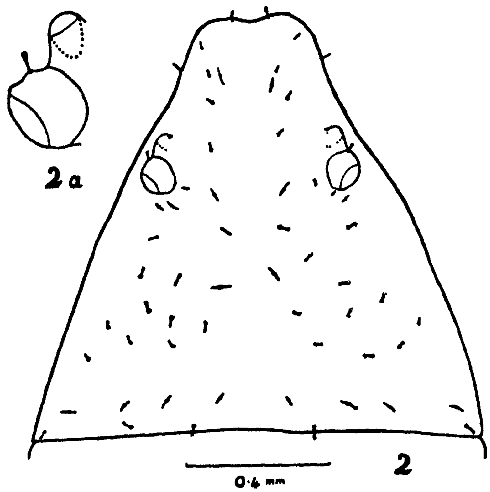
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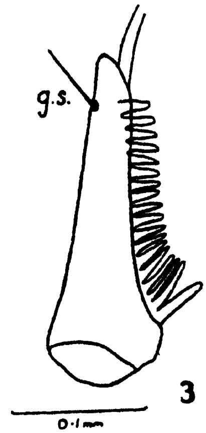
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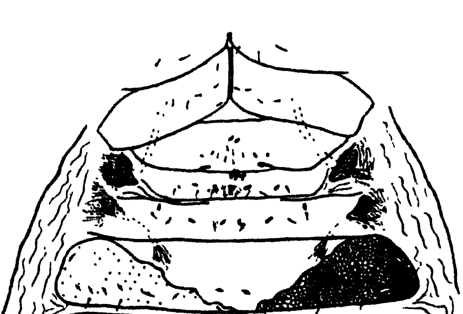
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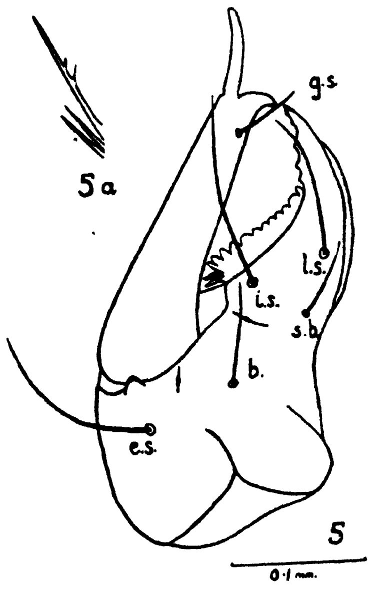
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5

A New Genus of Pseudogarypin Pseudoscorpions Possessing Pleural Plates

By

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(Read 11th November, 1947)

PLATES V, VI

I have been able to study this interesting new pseudoscorpion through the kindness of Professor V. V. Hickman, who made available a number of specimens he had collected near Launceston in 1931. All the specimens had been preserved in methylated spirits. They were boiled in 10 per cent KOH solution, and after clearing were mounted in Canada balsam. I find that this material consists of only one species and requires the establishment of a new genus. This genus belongs to the family Pseudogarypidae of the superfamily Feaelloidea. This superfamily as defined by Chamberlin (1931, p. 230) includes forms with 'either carapacal alae or abdominal pleural plates'. I propose to alter this to include forms with 'either carapacal alae, abdominal pleural plates, *or both*'. I also propose to alter Chamberlin's definition of the family Pseudogarypidae (1931, p. 230), which includes only those forms in which 'abdominal pleural plates are absent', to include forms in which 'abdominal pleural plates are *either* absent *or present*'.

Neopseudogarypus gen. nov.

With the characters of the family (viz., venom apparatus absent; lamina exterior absent; four prominent eyes; cucullus broad, well developed and strongly lobate; femoral articulation of all legs freely mobile and of similar structure (homofemorate); legs I and II similar superficially to III and IV. Anus ventral and, together with the minute anal (12th) segment, surrounded by a large sclerotic plate composed of the fused 11th tergite and sternite. Abdomen ovate and much broader than the cephalothorax; pedipalpi of the normal prehensile type; without a ginglymous articulation between the cephalothorax and abdomen such as occurs in the Feaellidae). Carapacal alae and three rows of abdominal pleural plates are present. Pseudocoxal spines on the coxae of the first pair of legs. Posterior pair of eyes are covered above by a sclerotised roof. A pair of accessory setae at the end of the fixed finger of chela. The serrula exterior is free for a short distance at distal end. Genital plates are not divided.

Genotype. *Neopseudogarypus scutellatus* gen. et. sp. nov.

Neopseudogarypus scutellatus gen. et. sp. nov.

(Plates V, VI, figs 1-20)

Professor Hickman informs me that all the specimens of this pseudoscorpion were found only on the undersurface of stones, and collected on the line of hills extending from Glen Dhu to Trevallyn, near Launceston, Tasmania.

The following description is based on three specimens: the holotype (female) and two paratypes (a male and a female).

Measurements. All the following measurements are in millimetres, and Chamberlin's method has been followed (1931, p. 24). Length always precedes breadth, and measurements of the segments of the palpi and legs are given in the order, trochanter (without pedicel), basifemur, telofemur, tibia and tarsus.

Holotype (Female)

Length 2·59. *Breadth of Abdomen (6th segment)* 1·824. *Carapace* (0·608-0·418), *Cucullus* 0·170, *Ocular breadth* 0·361.

Palpus—(0·228-0·27), (1·054-0·25), (0·456-0·209), *chela* (1·425), *hand* (0·513-*depth* 0·325), *fingers* (0·912 *fixed,* 0·890 *movable*).

Leg I—(0·143-0·150), (0·304-0·114), (0·290-0·114), (0·247-0·095), (0·46-0·06).

Leg IV—(0·290-0·165), (0·237-0·120), (0·437-0·155), (0·437-0·095), (0·650-0·06).

Chelicera—0·258, *depth* 0·137, *mov. finger* 0·109.

Maxilla—0·570, al. 0·44, b. 0·210, ab. 0·37.

Paratype (Male)

Length 2.415. *Breadth of Abdomen (6th segment)* 1·653. *Carapace* (0·589-0·380), *Cucullus* 0·152, *Ocular breadth* 0·325.

Palpus—(0·209-0·247), (1·007-0·22), (0·415-0·209), *chela* (1·311), *hand* (0·494-0·285 *depth*), *mov. finger* (0·817).

Leg I—(0·140-0·135), (0·255-0·11), (0·266-0·114), (0·228-0·090), (0·440-0·057).

Leg IV—(0·266-0·133), (0·230-0·115), (0·380-0·133), (0·418-0·085), (0·608-0·057),

Chelicera—0·246, *depth* 0·129, *mov. finger* 0·104.

Maxilla—0·532, al. 0·399, b. 0·209, ab. 0·325.

The colour of the preserved specimens is yellowish brown. The carapace (Plate V, figs 1 and 9) is much longer than broad, narrower than the abdomen. There is a slight trace of a median longitudinal furrow, as an elevated ridge runs along each side, and the space between these ridges is concave anteriorly. Each lower antero-lateral angle of the carapace is prolonged into a horn which arises from under the eye tubercles, and extends forward until almost in a line with the anterior median part of the carapace. The horns are not deeply separated from the central lobe, and are in this respect similar to those of *Pseudogarypus banksi* Jacot (1938). The anterior end of the carapace is folded under (fig. 10) and there is on this part a median longitudinal ridge. There is a trace of the posterior suture, which is situated almost at the posterior border of the carapace. There are two pairs of prominent eyes (plate V, fig. 4), the anterior pair looking antero-laterally, the posterior pair looking postero-laterally. The two eyes on each side are separated by less than an ocular diameter. The anterior eyes are on a very slight projection, but the posterior pair are borne on prominent tubercles. The posterior eyes are covered above by the sclerotised roof of the tubercle. Closely associated with the eyes are two lyrifissures. The carapacal alae are wing-shaped, beginning just behind and below the posterior eyes. The posterior rounded ends of the alae extend back almost until in line with the posterior margin of the coxae of the 3rd legs (Plate V, fig. 3). The surface of the alae is particularly rugose.

The coxal area is shown in Plate V, fig. 2, and is very similar to that of *Pseudogarypus*. Pseudocoxal spines (fig. 8) are present in the triangular posterior portion of the coxae of the first pair of legs. (In the holotype there are seven on each coxa.)

Between the abdomen and the carapace on the dorsal surface is a well-marked membranous area (figs 1 and 9). The abdomen is broad, narrower at the anterior end than the posterior end, broadest at the sixth segment. There are ten visible tergites in a dorsal view (Plate V, fig. 1), and of these the first eight are divided, and the ninth partly so, by a distinct membranous area. The tenth tergite is entire. The first two tergites lie between the carapacal alae. Measuring from the anterior to the posterior edge, the first tergite has the smallest, and the second the largest dimension. The tergites bare numerous minute setae. The arrangement of the lyrifissures is shown in Plate V, fig. 1, and will probably be typical of the genus. Although slight variations occur, the arrangement of one lyrifissure near the inner border and a group of two or three near the outer border for a half tergite is typical. The tergites (as is almost the whole surface of the chitinised parts) are marked in a reticulate pattern. The eleventh tergite is fused with the eleventh sternite and surrounds the minute anal (12th) segment. The ventral segmentation is as is usual for the family, the second (? or first) sternite being absent. The genital plates are entire, but the fourth to tenth sternites are divided by a membranous area. The fourth sternite is very narrow, and the anterior part of it is heavily rugose. The arrangement of the lyrifissures is shown in Plate V, fig. 2, and the genital plates with chaetotaxy and lyrifissures for both sexes in Plate V, figs 5 and 6. The genitalia of the male appear to be the same as figured for *Cerogarypus agassizi* Jacot (= *Pseudogarypus bicornis* Chamberlin 1923, Plate 5, fig. 14), except that there are only three setae on the crescent-shaped sclerites.

The pleural membrane and inter-tergal spaces are marked by wavy striations. The pleural membrane (Plate V, figs 3 and 7) is raised into three folds, and in each of these folds is a row of chitinised plates. It is interesting to note that the carapacal alae reach behind to beneath the second tergite. Corresponding to the remaining eight free tergites (the eleventh tergite and sternite are fused) there are eight sclerotised plates in the top row. Parallel to each carapacal ala there is a long chitinised area. Although this appears to suggest a correlation between these plates and the tergites, it may be purely coincidental.

The Chelicera. In a dorsal view the carapace hides all but the fingers. The hand is stout, and the outer and dorsal surfaces of it are roughly reticulated. The flagellum (Plate VI, fig. 17, *fl.*) is typical of the family—i.e., a pair of long, slender, simple setae curved distally. The other setae are also shown, but I am not sure of the homologies of these. The seta near the exterior condylar lyrifissure seems to be the 'exterior seta'. The galeal seta *(gls.)* and what appears to correspond to the laminal seta *(ls.)* are shown in Plate VI, fig. 18. The four lyrifissures are also shown in Plate VI, figs 17, 18. The serrula exterior consists of about 17 teeth. The distal part is free for a short distance (Plate VI, figs 17 and 19) and is produced into a 'beak'. The lamina interior is difficult to make out, but appears to be of a broad plate-like type. Near the apical tooth of the movable finger on the outer side is a second, smaller tooth. The galea is simple and like that of other members of the family (Plate VI, figs 17 and 19).

Pedipalpus. The coxa (maxilla) is very large, and is similar to that of *Pseudogarypus*. The central elliptical lyrifissure is very small. The shape of the palpus is shown in Plate VI, fig. 13. The chela is raptorial, with slender fingers,

both of which (especially the fixed finger) are gracefully curved (Plate VI, fig. 15). The chaetotaxy is also shown in fig. 15: *t* is about 1/5 the length of the finger from the tip and is much closer to *st* than *st* is to *sb* (*tip-t*, 0·18 mm.; *t-st*, 0·076 mm.; *st-sb*, 0·164 mm.; *sb-b*, 0·098 mm.). On the fixed finger *it* is about 1/5 the length of the finger from the tip, and twice as far from the tip as *et*; *ist* is about 1/2 way along the finger, and *est* is about 2·5 areolar diameters distal to *it*; *eb* and *esb* are separated by about 8 areolar diameters; *eb* is a little more than 1/4 of the finger length from the base of the finger; *isb* is a little more proximal than *esb*; *ib* is at almost the same level as *eb*.

Near the end of the fixed finger is a pair of accessory setae (Plate VI, fig. 14, *xs*) not so well developed as the regular tactile setae, and very similar to the condition found near the finger tip of some of the Heterosphyronida. Just proximal to the accessory setae on the fixed finger on the external surface is what appears to be a sensory spot. There is also one of these spots on the movable finger at about the same distance from the tip (Plate VI, fig. 14, *s*). The first two teeth at the end of the movable finger are rather small and close together (Plate VI, fig. 14*b*). On the fixed finger between the first and second normal teeth, and higher up on the inner surface is a small accessory tooth. The rest of the teeth are prominent, peg-like, not contiguous basally and are evenly spaced, 38 on the fixed, and 27 on the movable finger of the holotype.

The Legs. These are similar to those of *Pseudogarypus*, and are figured in (Plate VI, fig. 20). The surface of the legs is marked by the reticulated pattern. two pairs. The femoral articulations of all the legs are freely mobile. The tarsus consists of a single, relatively long segment. The claws and arolium are shown (Plate VI, fig. 20). The surface of the legs is marked by the reticulated pattern.

Remarks. It is most interesting to record from Tasmania a representative of the rare and unusual family Pseudogarypidae. Hitherto only two genera consisting of four species (*Pseudogarypus* (three species) and *Cerogarypus* (one species)) have been described—all from the United States of America. (Two fossil forms from Baltic amber have also been placed in this family (1937)). *Neopseudogarypus* therefore forms yet another link between Tasmania and the Americas.

Another feature is the possession of pleural plates. It is interesting to note that, hitherto, pleural plates have been described only in the aberrent, but related, family Feaellidae, but I am not sure that these plates are the same as in *Feaella*. I have already pointed out the possible correlation between the upper row of plates and the tergites, and the long, narrow plate parallel to the carapacal ala.

The serrula exterior is also interesting in that the distal end is free for a short distance, and in the possession of a forward projecting 'beak' (cf. *Feaella*).

Neopseudogarypus has more in common with *Pseudogarypus* than with *Cerogarypus*—both possess pseudocoxal spines; have a roof over the posterior eyes; in *P. banksi* the antero-lateral lobes of the carapace are broadly connected to the central lobe, and the positions of the tactile setae on the chela, including the accessory setae in *P. bicornis*, are similar to those of *Neopseudogarypus* (1946).

The holotype and two paratypes mentioned in this paper are to be deposited in the British Museum, and homotypes in the Australian Museum, American Museum of Natural History and the Muséum National d'Histoire Naturelle, Paris.

I wish to thank Mr. Clarke, Librarian at the University of Tasmania, and Miss Taylor at the Royal Society Library for obtaining papers for me. I also wish especially to thank Professor V. V. Hickman, not only for providing the material for study, but also for his kind and most helpful assistance.

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PLATE V

(All measurements are in millimetres.)

FIG. 1.—Dorsal surface without legs. Lyrifissures are shown.

FIG. 2.—Ventral surface with chelicerae and the left first and fourth legs dissected off. Lyrifissures are shown.

FIG. 3.—Side view, without pedipalpi and legs, showing arrangement of pleural plates.

FIG. 4.—Eye region.

FIG. 5.—Female genital plates with chaetotaxy.

FIG. 6.—Male genital plates with chaetotaxy.

FIG. 7.—Enlarged view of anterior part of pleural membrane of left side, showing pleural plates and folds. *c.a.*, carapacal ala.

FIG 8.—Coxae of first pair of legs, showing pseudocoxal spines.

PLATE VI

(All measurements are in millimetres.)

FIG. 9.—Dorsal view of carapace and carapacal alae, showing typical reticulation of portions.

FIG. 10.—Ventral view of anterior end of carapace.

FIG. 11.—Fourth left leg.

FIG. 12.—First left leg.

FIG. 13.—Ventral view of left pedipalpus.

FIG. 14.—End of (*a*) fixed finger, and (*b*) movable fingers. *x.s*, accessory tactile setae; *s*, sensory spots.

FIG. 15.—External view of right chela, showing chaetotaxy and dentition.

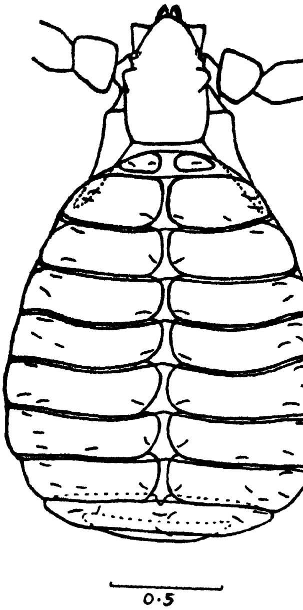
FIG. 16.—View of dorsal edge of left chelicera.

FIG. 17.—Ventero-lateral view of right chelicera. *fl.*, flagellum; *i.c.l.*, internal condylar lyrifissure; *i.l.*, internal lyrifissure.

FIG. 18.—Dorso-lateral view of right chelicera *e.c.l.*, external condylar lyrifissure; *e.l.*, external lyrifissure; *gls.*, galeal seta; *l.s.*, laminal seta.

FIG. 19.—Movable finger, showing galea and serrula exterior.

FIG. 20.—Ventral view of tarsus, showing claws and transparent arolium.



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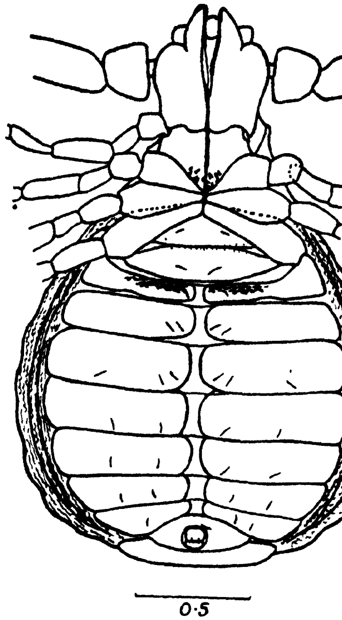

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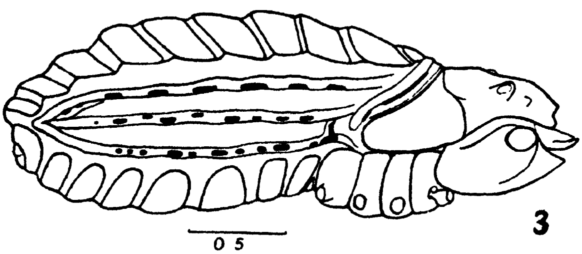

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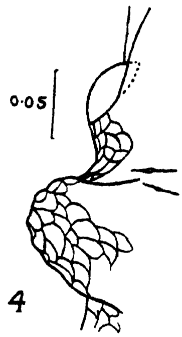

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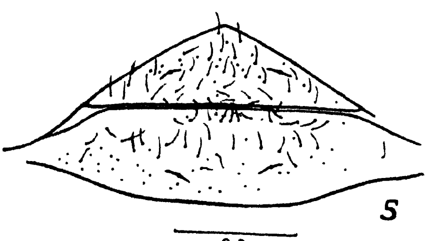

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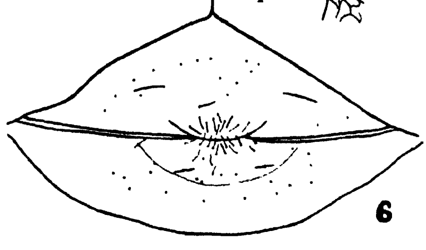

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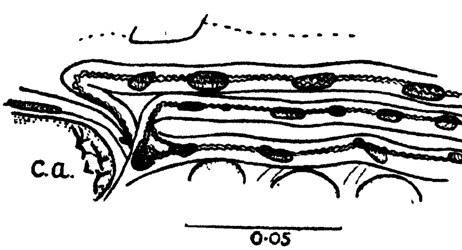

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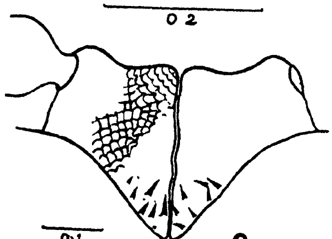

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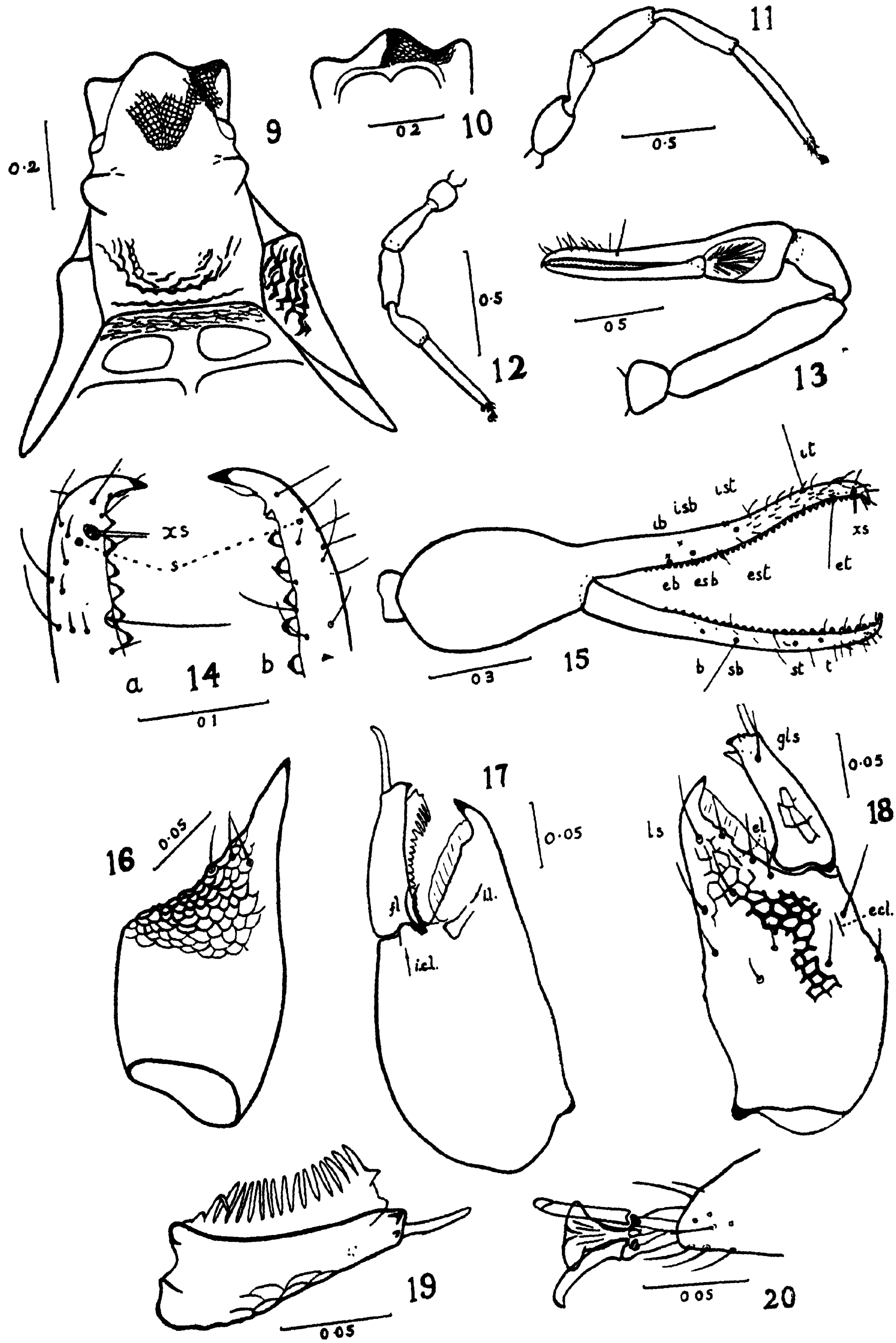
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A New Digenetic Trematode from the Barracouta *(Syncoeliidae-Digenea)*

By

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(Read 11th November, 1947)

FIGS. 1-9

ABBREVIATIONS USED IN TEXT FIGURES

Cop, copulatory organ; *Cut*, cuticle; *E*, egg; *Hd*, hermaphrodite duct; *Int*, intestine; *Met*, metraterm; *Mgl*, Mehlis' gland; *O*, ovum; *Oes*, oesophagus; *Oo*, ootype; *Os*, oral sucker; *Ov*, ovary; *Ovd*, oviduct; *Ph*, pharynx; *Pp*, pars prostatica; *Pros*, prostate gland cell; *Sem v*, seminal vesicle; *Sp*, spermatic fluid; *Sph*, sphincter; *Tes*, testis; *Ut*, uterus; *Yk d*, yolk duct; *Yk gl*, yolk gland.

On the twentieth day of May, 1947, Professor Hickman and I examined a dozen specimens of the Barracouta (*Thyrsites atun* Euph.), which had been taken by a fisherman operating from Nubeena. We found numerous individuals of a species of digenetic trematode attached to their gill-rakers. The majority of the digenetic Trematodes of fishes are internal parasites. Some species have been described from the gills and the pharyngeal region and certain forms have been found externally on the skin, although in such cases they are suspected of migrating thence from the pharynx or the intestine upon the death of the host. The present species appears well adapted for its relatively exposed habitat. Each individual attaches itself by the acetabulum to the apex of a gill-raker. Efforts to dislodge the trematode from its hold reveal a most tenacious grip, the tip of the gill-raker frequently breaking off and remaining in the acetabulum. This will be shown to result from specialisation of that organ accompanied by unusual internal muscular development.

The species strongly resembles *Accacoelium contortum* (Rudolphi) from the gills of *Mola mola* (L.), in superficial characters, but examination of the internal structure excludes it from the Accacoeliidae. Apparently a similar habit has resulted in parallel adaptation in spite of significant differences in internal organisation. The species presents unusual anatomical features and I have erected a new genus of the family Syncoeliidae Dollfus 1923, to accomodate it.

Family SYNCOELIIDAE DOLLFUS 1923

Capiatestes thyrsitae n.gen. n.sp.

Generic Diagnosis. Medium sized elongate distomes with extremely mobile fore-body. Cuticle non-spinous, papillate. Acetabulum pedunculate, elongated antero-posteriorly. Gape a longitudinal slit dilated at extremities. Extrinsic musculature of acetabulum well developed. Intestinal caeca sinuous, fused posteriorly.

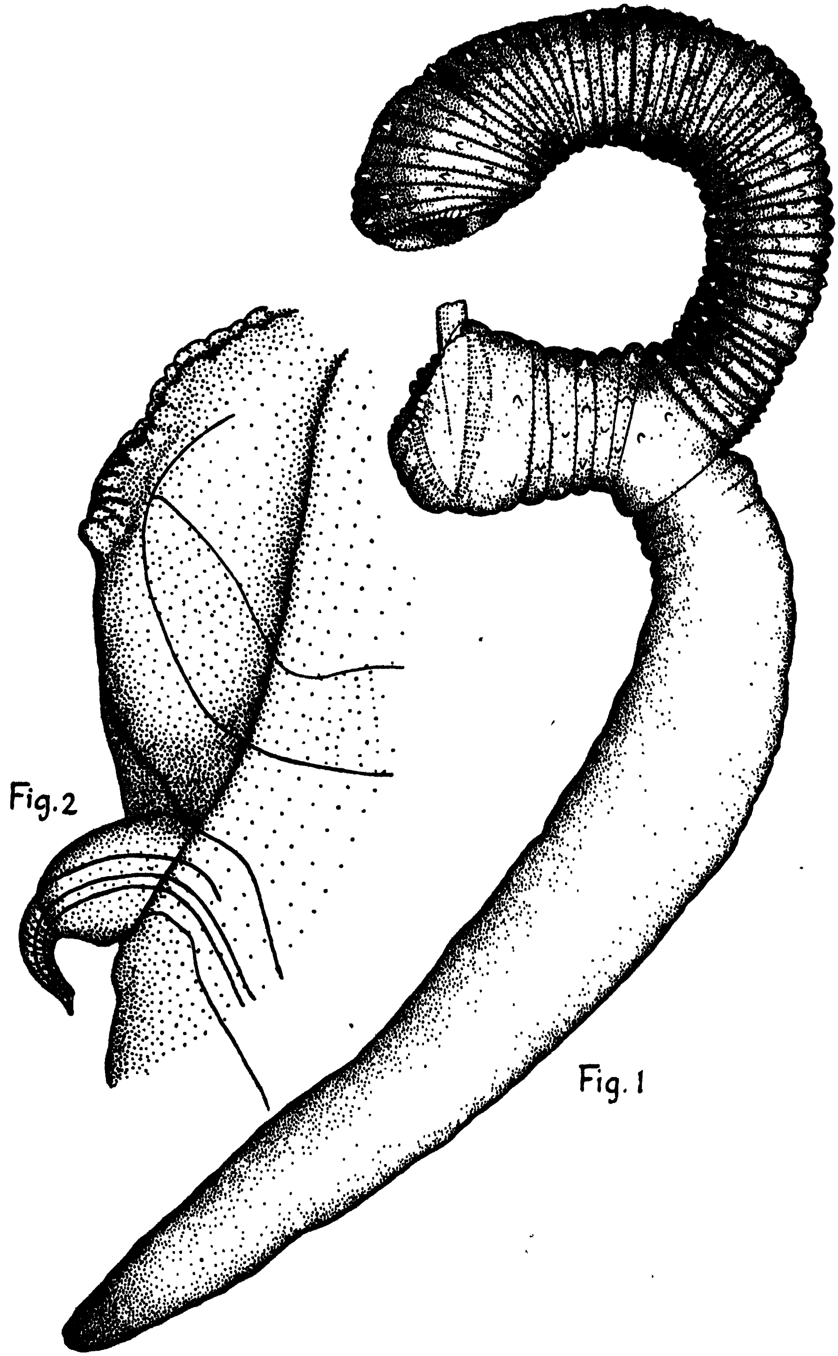


FIG. 1.—Unmounted specimen viewed from the left side. The acetabulum is seen to contain the broken apex of a gill-raker.

FIG. 2.—Portion of anterior end of a mounted specimen with the copulatory organ protruded.

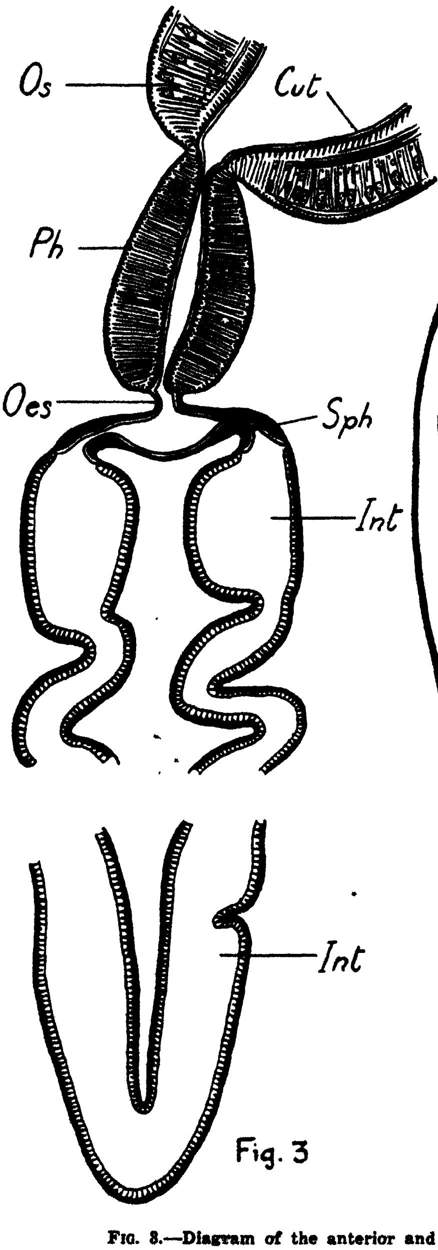
No connection between gut and excretory vesicle. Genital atrium large immediately behind rim of oral sucker, and containing protrusible copulatory organ. No cirrus or cirrus sac. Testes postacetabular, intercaecal, eighteen in number. Vasa deferentia two. Seminal vesicle long and tubular entirely in fore-body. Pars prostatica tubular, prostatic cells free. Ovaries post-testicular intercaecal, five in number opening separately into common oviduct. Uterus large, very long, regularly coiled in hind body dorsal to and obscuring gonads. Receptaculum seminis uterinum present. Eggs very numerous, small ovoid, thick shelled. Yolk glands seven in number, post-ovarian. Metraterm and pars prostatica fused, forming hermaphrodite duct. Excretory vesicle very short, lateral branches sinuous fusing anteriorly. Body tissue extremely glandular.

External Features. The worms are fairly large, measuring approximately 9-15 mm. long when contracted, but extending to a much greater length in life. The body is slender and clearly divisible into a cylindrical pre-acetabular region or fore-body, and a somewhat stouter tapered post-acetabular region or hind-body. When fixed free from pressure the worms contract into a characteristic shape similar to the numeral '3' (fig. 1). The middle arm of the '3' is formed by a stout pedicle, cylindrical in form, which bears the acetabulum. However, individuals mounted under cover-glass pressure may assume a variety of forms. In a large number of whole mounts the fore-body measures 0·48-0·72 mm. wide, the hind-body measures 0·77-1·28 mm. at its broadest point, and the pedicle measures 0·96-1·76 mm. long and 0·88-1·12 mm. broad. The cuticle is non-spinous, but on the fore-body and pedicle is produced into circlets of large, blunt papillae. When the fore-body is contracted, its surface becomes completely annular.

The oral sucker is terminal, with its aperture directed forwards and downwards. The oral aperture proper is bounded by a fleshy papillate lip. A second lip originates dorsally and runs obliquely backwards as it approaches the ventral surface, where it forms the posterior border of the genital atrium (fig. 2). This is a deep pocket-shaped invagination immediately behind the mouth. The acetabulum is elongated antero-posteriorly. It does not possess the usual cup-shaped cavity owing to the thickness of its lateral walls which reduce the cavity to a deep longitudinal slit. The slit-like gape is dilated at its extremities, the posterior dilation being the more pronounced. A fleshy papillate lip protrudes from the pedicle and surrounds the gape. The oral sucker is slightly larger than the acetabulum. In the whole mounts the former measures 0·72-0·88 mm. in diameter, while the latter which is mounted on its side, measures 0·56-0·72 mm. long and 0·4-0·5 mm. deep.

The excretory pore is situated at the posterior tip of the body. It leads into a short invaginated chamber.

Alimentary System (fig. 3). The form and position of the oral sucker is described above. A prepharynx is lacking, the oral cavity leading directly into the pharynx. This is pyriform, with its narrowest diameter at its junction with the oral sucker. It measures approximately 0·33 mm. long and 0·2 mm. in maximum diameter. A very short muscular oesphagus connects the pharynx with a transversely elongated chamber which extends directly to left and right for a short distance. On each side, the transverse duct is abruptly constricted by a strong sphincter into a narrow duct leading into the digestive tube. The oral sucker, pharynx, oesophagus, and transverse chamber are lined by an inward extension of the cuticle. Within the digestive tubes the cuticle is replaced by a digestive epithelium of densely packed cells. The cells stain selectively into two layers, the basal portions only absorbing nuclear stain. Although the proximal regions of the



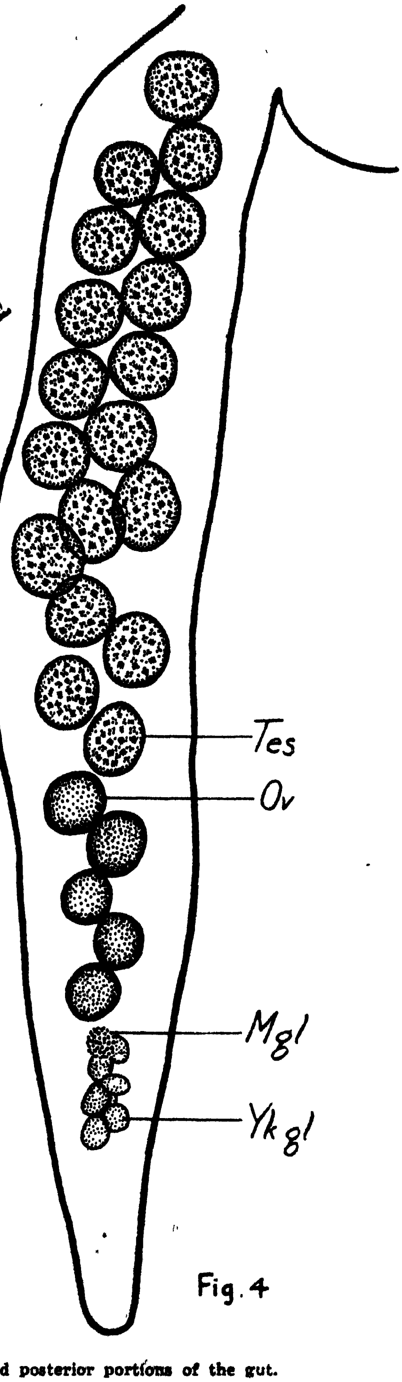


FIG. 3.—Diagram of the anterior and posterior portions of the gut.

FIG. 4.—The hind-body of a mounted specimen. The uterus and the intestine are omitted for clarity.

rami are typically somewhat expanded, no 'Drüsenmagen' are present, as the epithelium of the expanded portions appears identical with the lining of the remainder of the gut. The two gut rami run directly backwards through the fore-body at some distance from the lateral margins. In fixed contracted specimens, their course is extremely and regularly sinuous. In the post-acetabular region the rami remain in a lateral position, slightly towards the ventral surface. They are separated from the lateral margins by the uterus. As the body tapers posteriorly the rami approach one another and fuse in an acute arch a short distance from the posterior extremity. There is no anus or communication with the excretory system.

Excretory System. A narrow excretory vesicle runs forward from a short invagination at the posterior tip of the body and branches above the posterior arc formed by the fusion of the gut rami. The two main collecting trunks diverge and pass forward and downward until they come to lie ventral to the gut rami. In this position they pursue a sinuous course to the pedicle of the acetabulum. They describe convolutions within the pedicle and continue forward through the fore-body. Anteriorly, they expand and pass to the dorsal surface, where they fuse above the junction of the oral sucker and the pharynx.

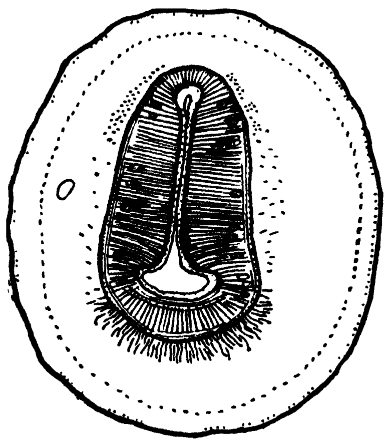


FIG. 5.—Transverse section through the pedicle and acetabulum which shows the form of the gape and a portion of the extrinsic musculature.

Muscular System. The oral sucker is a normal well-developed globular organ, consisting of the usual outer and inner, equatorial and meridional layers, separated by a parenchymatous zone which is traversed by weaker radial fibres. The pharynx is continuous with the oral sucker, but the meridional fibres are lacking. The radial fibres are stouter and more numerous. Few parenchymatous cells are present. The acetabulum is elongated antero-posteriorly. The form of the gape has been described above. It is a well-developed sucker, but is less muscular than the oral sucker. Numerous parenchymatous cells with abundant contents are present (fig. 5).

A most striking feature of the animal is the extreme development of the extrinsic musculature of the acetabulum. The pedicle is packed with stout fibres, which are inserted into the dorsal surface of the acetabulum. These fibres separate into anterior and posterior bundles. The anterior group occupies a central position in the 'neck' region. It partly encloses the seminal vesicle above and the uterus below. Most of the fibres terminate in the posterior surface of the oral sucker. The posterior group of the fibres passes backwards in the mid-line but below the

gonads and near the ventral surface. The vasa deferentia are enveloped. The fibres become diffused near Mehlis' gland. Scattered fibres run between the proximal portion of the uterus and the yolk glands.

The body wall of the pre-acetabular region contains well-developed muscle layers. These consist of outer longitudinal, inner oblique, and intermediate circular layers. It is unusual to find the longitudinal layer enclosing the circular. The former is more strongly developed ventrally. However, in the pedicle and in the post-acetabular region the longitudinal and circular layers are completely lacking. Here, the oblique layer consists of very numerous fine fibres.

The form of the acetabulum, coupled with the extraordinary development of the internal muscles, accounts for the tenacity with which the animal grips the gill-rakers of the host. A raker is always gripped in either the anterior or the posterior dilation of the gape. It is engulfed to the maximum extent possible. Thus its apex is thrust obliquely into the posterior or anterior roof of the cavity farthest from the entrance. When efforts are made to dislodge the animal,

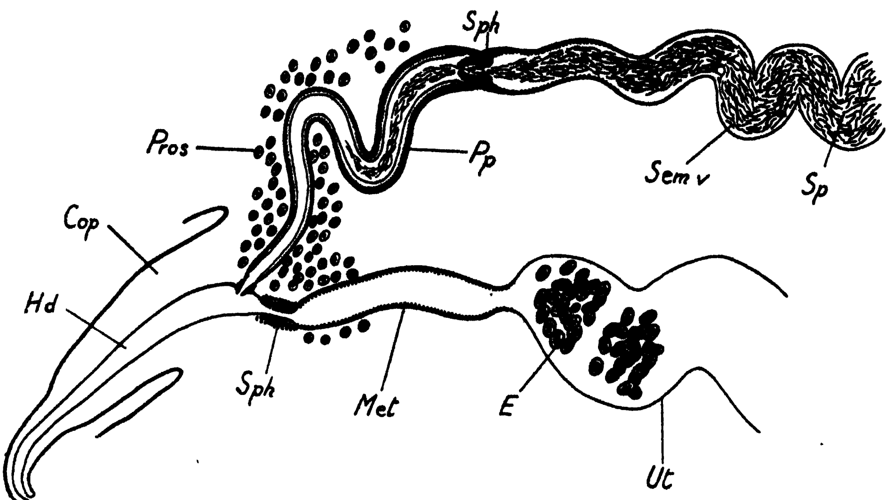


FIG. 6.—Details of the terminal genital organs. Drawn from longitudinal sections.

the tightly closed slit prevents movement of the raker along the length of the sucker to allow a direct pull. This results in the apex being levered further into the sucker. The musculature in the pedicle prevents the rotation of the acetabulum which would allow a direct pull with the resulting extraction. Further it appears that rotation in the opposite direction to that induced by the gill-breaker is set up. This causes the angle at which the raker enters to become more acute and that component of the pull in the direction of the raker is lessened.

Genital System: 1. Male. The testes are eighteen entire round, or oval, bodies measuring approximately 0·36 mm. in diameter in slightly compressed whole mounts. they occupy the intercaecal space immediately behind the pedicle and commonly occur in two alternating linear rows (fig. 4). In some whole mounts they are much displaced, and in strongly contracted flattened specimens become angular in form by mutual compression. Each testis leads by a narrow vas eferens into one of the two vasa deferentia. It was not established whether or not the collection of spermatic fluid is equally divided between the two male collecting ducts, but it is certain that the division is into anterior and posterior groups, as only one vas

deferens is present in transverse sections of the posterior testicular region. The vasa deferentia run forward in contact with one another within the large bundle of longitudinal muscle fibres arising from the acetabulum. Approaching the pedicle, they emerge from the muscles and pass towards the dorsal surface. A short distance in front of the pedicle they open into the seminal vesicle. This is a sinuous tube 0·06 mm. in diameter which runs forward through almost the entire length of the fore-body. It is situated near the dorsal surface and is enclosed ventrally by the longitudinal fibres which link the acetabulum and the oral sucker. As the seminal vesicle approaches the pharyngeal region its wall becomes muscular, due to the presence of increasingly stout outer longitudinal and inner circular fibres. The vesicle is then obstructed by a stout sphincter which projects into the cavity and encloses a narrow lumen. This separates the seminal vesicle from the pars prostatica into which it projects as a blunt conical nozzle (fig. 6). The pars prostatica is a strongly muscular tube lined with stout circular fibres and a thick, clear layer which resembles the prostatic layer of many other species but which

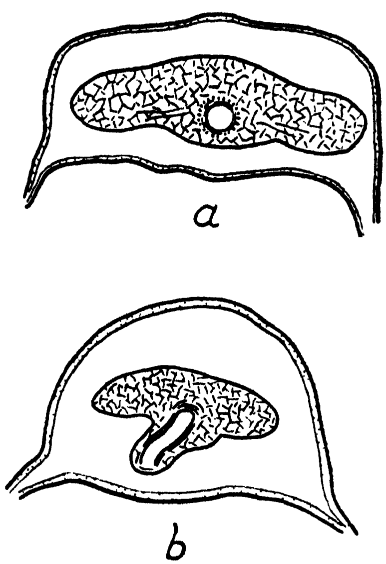


FIG. 7.—Diagrams of two transverse sections through the copulatory organ. (*a*) Near its base. (*b*) Approaching the tip.

does not appear to be of a cellular nature. The pars prostatica narrows and opens into the hermaphrodite duct through a small papilla. A well-developed prostate gland consists of numerous very small cells lying free in the tissue about and above the pars prostatica. The weakly muscular hermaphrodite duct perforates a well-developed copulatory organ, which is not to be considered a cirrus as it is clearly not derived from the male duct. It represents an outgrowth from the wall of the genital atrium. The organ is produced into lateral expansions near its base, but near the tip it narrows abruptly, forming shoulders and terminating in a slender recurved portion which is reminiscent in form of a miniature elephants trunk (fig. 2). Genuine copulation does not seem possible in this species, the copulatory organ serving to deposit spermatic fluid within the genital atrium of the other individual, from whence it is later drawn into the recipients body through its own copulatory organ.

2. *Female.* Five smooth, round ovaries occur in the intercaecal space immediately behind the testes. They are situated one behind the other, each being obliquely in contact with its predecessor (fig. 4). In slightly flattened whole mounts the ovaries measure 0·33 mm. in diameter. The ova measure 0·0125 mm. Each ovary leads ventrally into a branch of the common oviduct which runs directly backwards in the mid-line below the ovaries (fig. 8). After receiving the ducts from the ovaries the oviduct expands slightly and passes along the dorsal surface of Mehlis' gland. It then tapers and enters the gland. After receiving the yolk duct it turns forward and becomes the ootype. Here it receives numerous fine protoplasmic threads from the surrounding gland cells. The female duct then turns dorsad and emerges from Mehlis' gland as the uterus. The narrow proximal convolutions of the uterus lie behind the gland and function as a receptaculum seminis. The uterus passes to the posterior tip of the body, where it expands and begins a regularly

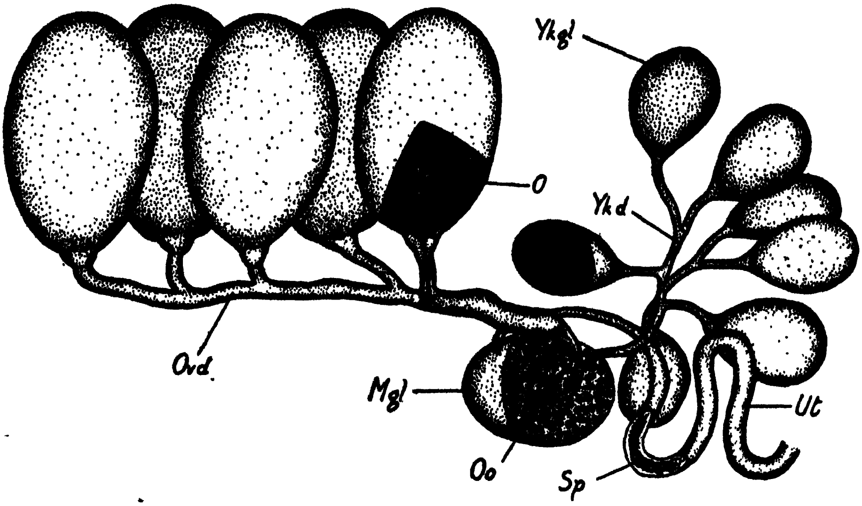


FIG. 8.—Diagram of the female complex reconstructed from sections.

convoluted path forwards. It is extremely long, turning alternately to left and right, the coils passing completely across the body dorsal to the gonads. The loops pass between the intestine and the lateral body margins on each side and extend inwards for a short distance near the ventral surface (fig. 9). On reaching the pedicle, the uterus turns directly forward as a sinuous tube which lies in the mid-line near the ventral surface. Dorsally, it makes contact with the muscle fibres connecting the acetabulum and the oral sucker. As it approaches the base of the copulatory organ the uterus narrows abruptly into a muscular metraterm which possesses well-developed outer longitudinal and inner circular fibres. Near the aperture of the male duct the metraterm communicates with the hermaphrodite duct through a strong sphincter (fig. 6). There is an interesting development in the nature of the wall of the uterus and of its contents as it progresses through the post-acetabular region. In the early convolutions, i.e., those near the posterior of the body, the uterine wall is membranous and the contents consist of a homogeneous mass of groups of yolk cells with their ova. The contents of each egg is bounded from its companions by a thin membranous covering. No sign of shell development is evident. However, as the uterus approaches the pedicle it becomes lined with large gland cells which are packed with darkly staining contents, and the

shells of the eggs become progressively thicker. In the loops of the uterus, immediately behind the pedicle and throughout its course through the fore-body, the eggs are fully formed and possess a thick golden shell. They are roundly ovoid and measure 0·025-0·03 mm. long by 0·0175-0·0215 mm. broad. This indicates that the shell-forming material is passed into the uterus by its glandular lining. The uterine glands are not present in the fore-body.

The yolk glands are constantly seven in number. Each is a smooth pyriform body measuring 0·16 mm. by 0·13 mm. which opens into a slender branch of the yolk duct. They are grouped immediately behind Mehlis' gland (fig. 8).

Discussion. The presence of a multiple of the usual number of two testes is not now thought unusual, but the writer has encountered only one description of a form possessing more than one ovary *Biovarium cryptocotyle* Yamaguti 1934. Species are known to occur in which the ovary is deeply lobed, e.g., *Paracryptogonimus americanus* Manter 1940, and *Metadena globosa* (Linton 1910), etc.

However, in *Copiatestes thyrsitae* n.gen. n.sp. the ovaries are separated well-developed organs. Similarly, although in the genus *Paronotrema* Dollfus which also belongs to the Syncoeliidae, the large number of testes are said to represent segments of two tubular testes (Manter 1940), this is not the case in the present species.

FIG. 9.—Diagram of the course of the uterus in the post-acetabular region. The gonads and intestine are omitted. Drawn from the ventral aspect.

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Notes on the Occurrence of the Nematode *Mermis nigrescens* Dujardin and its Effect on the Common Earwig in Tasmania

By

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(Read 11th November, 1947)

Since its introduction into Tasmania at a probably early date, the common brown earwig (*Forficula auricularia* Linn.) has multiplied and spread throughout the State. It is present in such considerable numbers as to cause great annual damage to fruit and green vegetable crops and is a scourge of the amateur gardener. *Forficula auricularia* has long been known to harbour the nematode *Mermis nigrescens* Dujardin. Baylis (1944) described the artificial infection of earwigs by feeding them aphids coated with the eggs of the worm. Baylis also indicated that the emergence of the larvae from the body of the host prior to the worm's sojourn in the soil brought about the death of the host. Further, earwigs were sometimes killed by heavy initial infections before the larvae had developed to any degree.

Mermis nigrescens Linn. has apparently been introduced into Tasmania through the earwig. This insect provides the University Zoology Department with a convenient source of the Sporozoon *Gregarina ovata* Duf. During the dissection of the earwigs, students and instructors frequently find the abdomen occupied by the well-developed larvae of *Mermis*. In class procedure this generally occurs in March or April. Infection apparently takes place in October or November of the previous year when the females of *Mermis* are stimulated by the warmth and moisture of the infrequent thunderstorms of that period. They rise to the surface of the soil and climb low plants to lay innumerable eggs.

Some indication of the incidence of *Mermis* in the earwig and of its effect on that host should not always prove of interest to Tasmanians but supplements the work of Baylis.

In January, 1946, one hundred earwigs were collected from my garden at Glenorchy, and dissected. The details of the infections are as follows:—

	Sex of Earwig	Worms Present	Respective Lengths mm.
January 4, 1946	f	1	72
	f	3	47 57 65
	f	2	54 65
	m	3	37 54 66
	f	1	29
	m	3	52 55 56
	f	1	86
	?	2	58 90
	?	2	55 88
	f	1	78
	f	1	34
	6m	0	

	Sex of Earwig	Worms Present	Respective Lengths mm.
January 10	m	2	54 90
	m	3	50 51 58
	f	1	75
	m	9	31 32 36 40 43 45 45 45 50
	m	1	100
	f	6	33 35 36 41 43 45
	m	5	30 35 36 53 5[illegible]
January 11	m	1	67
	f	1	120
	m	1	87
	f	1	100
	m	1	128
	m	1	34
	m	1	71
	f	4	42 42 46 84
	m	1	114
	m	1	68
	9m	0	
	3f	0	
January 14	m	2	39 102
	m	1	52
	?	8	25 29 34 35 39 41 41 41
	5m	0	
	9f	0	
January 17	f	2	83 85
	m	4	45 50 54 57
	m	6	32 33 35 40 42 45
	f	1	85
	1f	0	
January 19	f	3	55 75 77
	m	3	61 62 66
	f	1	97
	f	8	34 39 39 40 41 45 53 55
	f	4	42 51 55 58
	m	2	79 92
	f	3	59 71 75
	?	5	27 29 29 29 29
	f	9	34 35 37 38 40 41 41 42 75
	f	1	106
	m	1	? (emerged and damaged)
	m	9	22 25 32 35 36 38 41 55 67
	f	2	52 55
	f	1	83
	m	2	90 93
	m	1	108
	4m	0	
	11f	0	
	1?	0	

Thus fifty-one of the hundred earwigs were infected by *Mermis*. Generally speaking, the number of larvae present in a single earwig is in inverse ratio to their average size. This is to be expected, as the size of the body cavity of the insect is the limiting factor. The larvae are found tightly packed in the abdomen but may extend into the thorax. The worms lie free in the cavity, not being enclosed by a cyst or envelope of any kind. No fat body is present in infected insects and, whereas most of the females free from worms are carrying eggs at this time of the year, no eggs are present in infected females.

On the 8th February, 1946, Professor Hickman kindly collected eighteen earwigs at New Town. These remained in a jar, with lettuce leaves, for three days, at the end of which they were examined. Damaged and partly eaten nematodes were present in the jar and two male earwigs were dead. Of these two, the one appeared to be pierced ventrally between the posterior pair of legs and the other between the fifth and sixth abdominal segments. Of the remaining sixteen insects only one male was found to be infected. Two larvae were present 32 and 102 mm. long respectively.

On the third of March I collected a further one hundred and thirty-eight earwigs from my garden at Glenorchy. One hundred and twenty were dissected, but only thirteen of these were infected. The remaining eighteen, which appeared to be distended and therefore likely to contain worms, were separately confined in Petri dishes containing lettuce and a moist filter paper. These were observed daily and the following noted:—

March 5: One larva 86 mm. had emerged from a female earwig which died during the evening.

March 6: One larva (partly eaten) had emerged from a female which died on March 8th.

March 7: One larva 111 mm. had emerged from a female which died during the evening of March 8th.

March 8: No emergences.

March 9: Two larvae 51 mm. and 65 mm. had emerged from a female which died during the evening of March 10th.

March 10-16: No emergences.

March 17: One larva 74 mm. had emerged from a male which died during the evening of March 19th.

As no further emergences had occurred by April 8th the remaining thirteen earwigs were dissected and found to be free from infection. All the females contained eggs.

On March 15th a parallel experiment was conducted with a number of earwigs collected from New Town. The following observations were made:—

March 20: A larva 121 mm. had emerged from near the anus of a male earwig. The insect bled a little from this region and died during the evening of March 21st.

March 25: Three emergences had taken place—

1. A larva 116 mm. had emerged from a male which was bleeding from the abdominal spiracles. The insect died on March 26th.
2. Two larvae 62 mm. and 126 mm. had emerged from a female which was now dead.
3. A single larva 148 mm. had emerged from a female which died on March 26th.

A further eighteen insects were dissected on April 8th. One further male was found to be infected containing a single larva 73 mm. The females all contained eggs.

These results showed that emergences of *Mermis* are taking place rapidly during March and resulted in all observed cases in the death of the host earwig.

Summary

The presence of *Mermis nigrescens* Dujardin in the body cavity of the common earwig *Forficula auricularia* Linn. in Tasmania is reported. This is considered to be of some economic importance in Tasmania, as it reduces the earwig population in the following ways:—

1. The presence of nematode larvae prevents the formation of eggs during a period in which the females are normally producing offspring.
2. It is possible that the fertility of the males is similarly affected.
3. The emergences of the nematode larvae are responsible for a considerable number of deaths.
4. Very heavy initial infections may cause the death of the host (Baylis 1944).

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Péron in Tasmania

By

L. A. TRIEBEL

(Read 11th November, 1947)

François Péron, French scientist and explorer, was the first man to write, after direct contact, an accurate account of the Tasmanian aborigines. His record of their vanished race is a monument of careful and truthful observation. Supplemented by the modern anthropologists' wider knowledge of the origin of Tasmania's earliest inhabitants, the French naturalist's description merits close examination.

Professor Wood-Jones and others have analysed the evidence proving that the Tasmanians belong to the Melanesian Negroid stock nearly related to the New Caledonians, the Philippinos and Fijians—a race distinct from the Australian natives—and that Tasmania's aborigines came by sea from their Melanesian island home; a fact which, however, does not preclude inter-relations with those of the mainland. Wood-Jones tells the story of the race after contact with European voyagers and from the date of the Risdon settlement; physical and social characteristics are excellently described. The burden of his conclusions, identical with those of other Tasmanian historians who quote from the earlier parts of Péron, is that the cheerful, laughter-loving people, 'living happy lives in their native forests, languished under the régime of the kindly, but misguided catechist, the military, and the impressive administration of British justice'. Now, to what extent were the Fathers of the Church in Tasmania and the Old Flag to blame?

Péron's recorded observations are so frequently referred to that it is pertinent to examine them more closely with a view to determining whether the work of the brilliant French scientist, trained as he was by Cuvier, Laplace, Lacépède, and other world-renowned members of the Institut de France, justifies the words 'cheerful, friendly, laughter-loving and happy', as applied to Tasmanian aboriginals with whom Péron consorted during the stay of some months in southern and eastern Tasmania and on the islands of Bass Strait. Did he see them through rose-tinted glasses as perfect children of Nature and draw of them pictures coloured by the doctrines of Rousseau and so let his enthusiasm outrun scientific accuracy?

By reading the French text I discovered that the modern anthropologist's attitude to aboriginals may be akin to Rousseau's towards the noble savage running wild in woods (which made Voltaire want to walk on all fours and of which Dryden had known something). Péron, however, at the end of the only volume that he himself wrote of his voyages, after many native contacts made by him and other members of the Baudin expedition sent out by Napoleon (1800-04) just before the British settlement at Risdon and the massacre, flatly denounced Rousseau's worship of the uncivilised state and warned other travellers. Péron was early disabused of his first impressions during a chance encounter with a Tasmanian family.

François Péron has been the subject of several French memoirs. An excellent account of him was also given by the late Sir Ernest Scott in 'Terre Napoléon', in spite of some mistranslation from the original documents. Born in 1775, Péron fought in the revolutionary army on the Rhine, was wounded and taken prisoner. Exchanged in 1794 and suffering the loss of an eye, he devoted himself to medicine and to comparative anatomy. Lacépède encouraged the student to read a paper before the Institute. His biographer affirms that Péron was disappointed in love at the time (some women prefer a two-eyed man) and that his main theme, the desirability of having a trained anthropologist with Baudin's expedition, was also not unreasonable from a personal point of view The Institute convinced the Minister of Marine: Péron, with detailed programmes suggested by Cuvier and Lacépède, joined 'Le Géographe' just before she sailed on her purely scientific exploration, ultimately rich in zoological and botanical results, but poor in geographical gains. So bad was the map-drawing of the French navigators that Scott had little difficulty in demolishing the charge that they had copied from Flinders whilst the latter was imprisoned on Mauritius. However, Captain Baudin's chief cartographer, Freycinet, who completed Péron's history of the expedition, used information volunteered by Flinders. The latter's 'Investigator' carried a midshipman by name John Franklin, when British and French met in Port Jackson during 1802. Fifty leagues of charted coast was the full extent of Terre Napoléon. Péron wrote in glowing terms of the prosperous young colony of New South Wales and of British hospitality to an enemy, for, despite the long and bitter naval warfare of the years leading to Trafalgar, the Admiralty had made out passports promising safe conduct to Baudin's ships. True science, like philosophy, music, art, and literature, is often super-national.

Péron's biological specimens were classified and discussed between 1804 and the year of his death, 1810. By order of Napoleon, the first part of the historical account was published at the Imperial Press in 1807; the second, mainly by Louis Freycinet, in 1816. Atlases and a series of excellent coloured engravings were also issued, these depicting aborignals, native weapons, adornments, baskets, canoes, huts, and tombs observed on the southern and eastern shores of Tasmania and on some of the islands in Bass Strait. The title of the finely printed and well-preserved volumes in the library of the Royal Society of Tasmania and in the Tasmanian State Library is 'Voyages de découvertes aux Terres australes, exécutés par ordre de sa majesté l'Empereur et Roi, sur les corvettes Le Géographe et le Naturaliste—pendant les années 1800, 1801, 1802, 1803, et 1804'.

The scientific equipment of Baudin's expedition was lavish; but Péron and Freycinet have little to say in his favour as a navigator. Food supplies were bad after Mauritius and the journey to the West Australian coast took 220 days. The charts made of the north-west coast were ill-defined and inaccurate, whilst Port Darwin, like Port Phillip later, was missed altogether. Scott mentions the interesting detail that when Péron came to write his account in Paris during October, 1805, he named a small island off the broken coast of the Kimberley division 'Isle of Lucas', in honour of the captain of the 'Redoubtable' from whose mizzen-top a shot had fatally wounded Nelson. Scourged by scurvy and separated from the 'Naturaliste', Péron's ship made Timor for water and fresh fruit; thence she turned and stayed in Tasmanian waters for three months. This was the longest stay of any white navigators during the time of unchallenged aboriginal possession.

No steps were at any time taken towards a French settlement. Renewed scurvy and heavy storms compelled the expedition to sail for Port Jackson. The crew were in such a plight when they stood outside the heads that a party of blue-jackets

from the 'Investigator' had to take the Frenchmen to safe anchorage in Neutral Bay. A stay of six months enabled Péron to visit the country around Sydney; of the latter he wrote in admiration. Once more Baudin's men then set out on their leisurely way—King Island, Kangaroo Island, further explorations on the west and northern coasts, then Timor again and home *via* Mauritius, with a rich load of specimens, including emus, kangaroos, and black swans. At Shark's Bay, Péron, unlike Tasman when he discovered Van Diemen's Land, was not deceived by the crew's reports of giant footprints and of fierce blackfellows of extraordinary strength and stature. Together with two of Baudin's officers, he advanced boldly towards a group of forty Australian aborigines. This show of fearlessness by the three whites disconcerted the blacks who slowly vanished. None was over 5 feet 4 inches in height; many were thin-limbed and feeble-looking.

Cuvier later reported highly on the skill and diligence of Péron in classifying an enormous number of specimens. His personal character appears from an obituary notice printed in the 'Moniteur' and contributed by one of the ship's surgeons under Baudin—'Péron carried upon his face the expression of kindliness and sensiblity . . . he made himself useful to most of those who were the companions of his voyage. There was joined to his confidence a great modesty. He was so natural that it was impossible to resist the charm of his manners'. One valuable contribution to knowledge made by Péron was his explanation of the structure and functional processes of those mass-organisms producing phosphorescence in the sea. At the feet of the great Cuvier he had learnt the importance of structure and function in the lives of creatures; Péron's own life was too short for him to master the mass of material collected in those four years at sea.

Péron was the first trained anthropologist to enter into personal relations with Tasmania's vanished race; on January 13th, 1802, Baudin's ships sailed into Port Cygnet. The earliest encounter with Diemenese was pleasant. A party searching for water met two natives with their gins. The younger black was so amazed when given a glass bottle that he threw it into the sea; he was also extremely puzzled by the way in which the whites' boat was moored. When a fire was lit a sailor took off his fur gloves to warm his hands. Péron adds—'The young woman at the sight of that action gave forth such a loud cry that we were at first alarmed, but we were not long in recognizing the cause of her fright. We saw from her expressions and gestures that she had taken the gloves for real hands, or at least for a kind of living skin that could be taken off, put in pocket, and put on again at will. We laughed much at that singular error; but we were not so much amused at what the old man did a little later with a bottle of arack. As it contained a great part of our drink, we were compelled to take it from him, which he resented so much that he went off sulkily with his family in spite of all I could do to detain them longer'.

The naturalist's excursions delighted him. Within a space of two hours he collected forty new species of molluscs, shell, crustacesus and fish; whilst he noted the plumage of swarming parrots and the 'blue head and neck' tomtit. He came across one or two wretched aboriginal huts, semi-circular shelters, made of bark supported against dry branches—rough protection against the south-west wind. Around the huts arose putrid and nauseous odours from animal remains in shells. Péron also examined the natives' 'unskilful attempt at the art of navigation'—canoes, each formed of three strips of bark clumsily joined together and fastened with a slip of the same bark. A family of nine natives was next encountered; they were loaded with shellfish. For a while all were confident, bidding the whites to sit down (*medi, medi*) and share a meal of fish broiled on flat stones. Péron and his companions roused admiration by rendering the song 'so unhappily

prostituted during the revolution', nevertheless 'so full of enthusiasm and spirit'. He was impressed by the lively, merry children, and by the gentility and charm of a young woman, Ouré-Ouré, who showed him the use of burnt charcoal crushed in her hand for fard; it was like red ochre, an ornamental grease for hair and body He examined the native granite knives, axes and points of assegais. The idyll ends abruptly when a shot is heard, fired by a hunting party of the expedition. Péron reflects on the privations and miseries of the state of nature, but concludes that the character of the women is less dependent than that of men on the influence of climate, on physical causes and the improvement of society. But their bodies were torn by bush and bramble; the bodies of the older women, he remarked later, were scarred with wounds, the result of bad treatment by their superior spouses.

Péron's subsequent meetings with the Tasmanian aboriginals in 1802 caused him radically to revise his views on 'our good Diemenese'; he appears contented with his scientific observations, these including the determination of many Tasmanian tree species; giant eucalyptus, 180 feet in height and as much as 36 feet in circumference, are noted. Throughout his account he admired landscapes of mountains and glades; the Port of Swans charmed him. The fiercest Tasmanian aboriginals were those of the islands in the Channel, particularly Isle Bruni and Isle Maria. In the original Péron, the evidence is clearly set out on pages 235-239. Anthropologists and historians have, to the best of my researches, overlooked it. I draw attention first to the Maurouard incident.

It will be noted that, as in all their native encounters, the Frenchmen loaded the aboriginals with gifts. This, however, is the only aboriginal outrage recorded by Péron for which the white man attempted retaliation. It appears that in speed alone was he surpassed by the blacks. A few days later, in another part of the Channel, a native attack followed. Showers of stones fell on the same party, the assailants lying in ambush. More serious was the assault on one of the artists with the expedition, M. Petit, who with others, including Baudin, had meanwhile made contact with other islanders. I translate what Péron says—'I discovered on my return that on the morning of the 15th (January, 1802), the jolly-boat of the "Géographe" having gone to fish on Bruni Island, the natives had appeared in great numbers and that our ship-mates had given them many presents and spent the greater part of the day in their midst. Monsieur Maurouard, one of our cadets, eager to test for himself the much-vaunted strength of barbarous tribes, had suggested a wrestling match to one of the natives who appeared to be the strongest. The Tasmanian, having accepted the challenge, had seen himself thrown several times in succession by the French midshipman, and had been compelled to admit himself beaten. From then on till the time of leaving several hours later there had apparently been no weakening or change in the trustful and friendly character of the natives; however, although our friends had given them still more presents, so that suspicion was out of the question, at the very moment of reshipping, Monsieur Maurouard was suddenly hit on the shoulder by a long assegai thrown from behind the rocks nearby. This uncouth weapon had been hurled with such force that after glancing the whole length of the shoulder-plate, it had penetrated the flesh between shoulder and neck. The crew of the jolly-boat were exasperated by this barbarous and cowardly treachery and had sought vengeance upon the savages by pursuing them; but, already, all had disappeared amidst the rocks and undergrowth.

'Soon after our return the commander himself came back from a short excursion on the mainland (*i.e.*, of Tasmania). With him had been Captain Hamelin, Monsieur Leschenault (botanist), and Monsieur Petit (artist). These gentlemen had again encountered the natives, and this interview also was ended

by a violent attack on their part. As a matter of fact, Monsieur Petit had made a sketch of several of the natives, when one of them, as our party was getting ready to return to the ship, threw himself on the artist and tried to snatch from him the sketches that he had just finished. On being resisted, the infuriated savage seized a log and would have killed our weak messmate if the others had not rushed to his aid. However, and far from trying to avenge such an insult, they took pleasure in loading the aggressor with fresh presents, doubtlessly in the hope of calming his fury with such generosity and of winning his goodwill and that of his fellow countrymen. Yet hardly had these sullen savages seen our men engaged in re-embarking when they themselves again made for the woods. A moment later a hail of stones fell; one stone struck the commander on the lower part of the back and caused a large, severe bruise. In spite of such baseness our comrades still persisted in their generosity. In vain the savages exposed themselves to shots by provocations from the beach just left; it was useless for them to brandish their assegais and to make more threatening gestures; not a single gun-shot was fired at them '.

Not a single shot fired in retaliation; the aggressors were overwhelmed with gifts! And still treacherous attacks were made from under cover. Vast tracts of bush were fired by the aborigines to scare off the expedition. One of the officers, Captain Hamelin, observed thirty-six natives marching along the shore in groups of five or six, each with one man carrying a bundle of assegais; and at the head of this little army one man with a burning poker in hand set fire to bushes hiding the ground. Other threatening parties were noticed on shore, and of the bush-fires Péron says that the ferocious inhabitants thus destroyed their ancient and venerable forests. Once more, with two companions, he advanced on a horde that retreated before them up a mountain whose slopes were burning—once more the natives melted away.

Péron quotes, with approval, the views of the botanist, Leschenault, on the hostile aboriginal attitude to all attempts at conciliation—' The latest attacks were made by the natives without our having in the slightest degree given any occasion for them; on the contrary, we had loaded them with gifts, and nothing in our bearing could have given them offence. I confess myself astounded, after the reports of so many instances of treachery and cruelty in all the voyages of discoveries, to hear rational people repeat the opinion that men living in a state of nature are in no wise evil and that they can be trusted and that they will not be aggressive unless they are excited by vengeance. Unfortunately, many have fallen vicims to such vain sophistries. For my own part, I think that, in consequence of all that we could see, it would be impossible to be too mistrustful of men whose nature has not yet been refined by civilisation, and that prudence should be exercised in landing on shores inhabited by such men '.

On Bruni Island, Péron and others had one more relatively harmless chance encounter with a party of native women; their form and features were repulsive; many were covered with sores, two or three of the younger ones excepted. Again a French song rendered them friendly. One of them made a kindly effort to colour the naturalist's skin to her fancy, he submitting in the cause of science. A face to please her should be black; charcoal was the lady's substitute for science. He learnt that the white European skin was really a defect or deformity which must give place to the hue of charcoal or of red ochre. On the sudden reappearance of their men-folk, the women dropped the catch of crab-fish at their feet and cowered silently on the sand dunes at a distance from their men whose surliness promptly ended the hospitality towards the strangers.

Péron's remaining pages on Tasmania continue his scientific observations (basaltic rock, volcanic scoria, new fish and shells, lichen, fungi, mosses, grasses, sea-grasses, with comments on snow-capped mountains and further notes on the aboriginals and their habits. A 'tetraedre' pyramid reveals one of their burial-places; this was a monument made of bark covering charred human bones in a small hole and indicating the custom of burning the dead near the sea and near a stream of fresh water. On Isle Maria, where two carpenters were savagely attacked, Péron studied the physical proportions of aboriginals whom he managed to interest for short spells before their suspicious, restless perfidiousness asserted itself. Few were over 5 feet, with head enlarged, shoulders bony and disproportionately large, legs lank and weak. Here the natives were extremely covetous; liberal presents of knives and handkerchiefs failed to satisfy one who grabbed at Péron's jacket and savagely pulled at his gold ear-rings. Moreover, Péron collected dynamometric data based on Regnier's apparatus and found that none of the aboriginals could move the beam as far as he could. One historian asks that account should be taken of their lack of familiarity with the instrument which attracted them, and with the white men's directions for its use. But he quite overlooks the fact that Péron tested their grip with his own hand and that none could release his grip! This is conclusive evidence, supported as it is by the story of the wrestling match, of the physical inferiority of the blacks, whose moral status is perhaps best designated by 'cowardly ferocity'; their intelligence was low. Péron, the ex-revolutionist, ends the account of his visit to Tasmania with a warning against the state of nature glorified by the heirs of Rousseau and perhaps by some anthropologists.

PAP. AND PROC. ROY. SOC. TASMANIA, 1947 (1ST AUGUST, 1948)

The Diary of the Rev. Robert Knopwood, 1805-1808*

Continued from the Papers and Proceedings
of the Royal Society of Tasmania, 1946, p. 124

JANUARY 1807

Thursday C.S. New Year	1	at 10 the morning cool & rain is very much wanting the grass all dried up and the Country on Fire by the Natives at 1 p.m. I waited upon the Lt. Govnr my Men came down the River from Hunting in the Eve a little Rain Lt. Henderson was put under an arrest for ungentleman-like conduct by Capt Johnson
Friday C.S. Longtown	2	am this morn I sat upon business at my House at home all the day
Saturday C.S. South	3	am at home all the day till 3 p.m. walkd out to Mr. Bowdens—Capt. Johnson came home with me
Sunday C.S. Leedlow	4	am my not being sufficiently recovered Divine Service was not performd—at 4 p.m. I dind with the Lt. Govnr
Monday C.S. Luton	5	At home till 2 p.m. when calld upon Capt. Johnson Mr Bowden & Lt Lord calld in the Morning this day began Wheat Harvest at the Govmt Farm
Tuesday C.S. Limington	6	at 8 a.m. I walkd with the Govnr to the Farm where we Breakfasted and returnd home about 12 at 8 it began to Rain ½ past 10 a very fine shower and very dark
Wed. C.S. Cheshire	7	the morning fine after the Rain. at 11 I went across the Water and killd three snipes came home late to dinner

January 1807

Thursday C.S. Kent	8	am at 5 I got up and went to the Govmt Farm to see them Reep and returnd to Breakfast at 12 waited upon the Lt Govnr

* Prepared for publication by W. H. Hudspeth and S. Angel from the original manuscript in the possession of Miss Mabel Hookey, Rokeby, Tasmania.

Friday C.S. Essex	9	am at 9 G. P. Harris Esq Breakfasted with me at 11 I sat upon the bench and was detaind there on business till 3 p.m.
Saturday C.S. Malpas	10	am at 9 Mr. Harris Breakfasted with me and we walkd to the farm upon business in the Eve I calld upon Mrs and Mr Groves, was taken ill at night
Sunday C.S. Manchester	11	am at 11 performd Divine Service and was obliged to go to bed as soon as it was over, 4 p.m. I dind with his Honor the Govnr—Performd Divine Service at the Carpenters shop
Monday C.S. Mansfield At 9 I married Mr Cockrells daughter to Mr Littlefield settlers	12	am at 11 I went to the Court and sat upon some prisoners that had killd a Goat, found them Guilty and Sentenced North, Long, Vasey to receive 500 Lashes and Cruse and Briscoe 300 for absenting themselves from the Colony Capt Johnson Lieut Breedon Mr Bowden & Mr Fosbrook came to the Court to hear the trial very unwell the Settlers and people very busey in Harvest—
Tuesday C.S. Margate	13	am at home all the day unwell

January 1807

Wednesday C.S. Marlow	14	am at home all the day
Thursday C.S. Maryport	15	am at 10 I went to Risdon and found Mr Mountgarrets House burnt to the ground by Rush and Hunter, received the information from Gadsby a prisoner who was at work at Mr Clarks Farm
Friday C.S. Matock	16	am upon business all the morn at Court and all the Civil officers came to Court Stayd at home the remainder of the day
Saturday C.S. Midhurst	17	am at 8 I went down the River afishing sell five to the Hills near my House.
Sunday C.S. Middleton	18	am at 11 performd Divine Service. 5 p.m. dind with Captain Johnson and bought a dog name Chance gave him £25 for it

January 1807

Monday C.S. The Queen	19	am the morn very warm at 12 a Royal Salute of 21 Guns was fird from the ordinance this day I began my Wheat Harvest. Gains Richardson Earl <u>Haffart</u> reapd the wheat

Tuesday C.S. Milford	20	am at 11 I took a walk with my Gun did not see a Kangarro, the Country so lately set fire to by the natives. at 6 p.m. we had a moderate shower of rain my men cut a little Wheat
Wed. C.S. Minehead	21	am at home all the day busy in Harves this Eve we had a little Rain
Thursday C.S. Modbury	22	am at five I went out afishing and had very good success came home to Breakfast at home all the day busy in harvest 5 p.m. we had Thunder at a distance
Friday C.S. Monmouth	23	am at 5 went out afishing had very good Success. at 11 waited upon his Honor the Lt Govnr Sat upon the bench, returnd home at 1 p.m. busy in harvest Mrs. M. C birthday = 24 octate
Saturday C.S. Montrose	24	am at 6 I went out afishing had very good success returnd home at 9.11 we had Thunder at a distance many of the farmers have got most of their corn in
		January 1807
Sunday C.S. Moreton	25	am at 11 performd Divine Service at 4 p.m. I dind with the Lt Govnr. we got exceedingly Merry
Monday C.S. Needham	26	am at 11 sat upon the bench to try Archers (?) for mealing some corn belonging to Government this aft had a fine shower of Rain
Tuesday C.S. Newberry	27	am at home all day sent 3 men out aKangarroing busy about the Corn
Wednes C.S. Newmarket	28	am this morn Engaged a man to break up some Stubble ground, walkd to the Farm upon business Watts a Prisoner was taken. wounded a Marine and got away
Thursday C.S. Newpork	29	am at home all day busy about my Corn and in my Garden. in the Eve I took a walk with my Gun and was lost did not get home till late at night
Friday C.S. Northhampton	30	am at 12 calld upon the Govnr and stayd some time, at home else all day got some more corn cut the Country all on fire by the Natives Capt Johnson calld upon me
Saturday C.S. Northhampton	31	At home all the day

Feb. Sunday	1	am at 11 performd Divine Service 4 p.m. I dind with the Govnr at 6 Mr Collins Boat came up the River Cape Barren where they had been aseeling since September killd 2000 Seals

February 1807

Monday C.S. Oakampton	2	am This morn got all my wheat in my barn and my men came down the River no success in Kangarroing
Tuesday C.S. Olney	3	am employd all day in getting up Potatoes Jones was taken at Risdon by Mr. Clark absent on the 1 of Oct. 1806
Wed. C.S. Orford	4	am at 8 I went out ashooting and Kild a Couple of Ducks very bad success in fishing
Thursday C.S. Ormskirk	5	am at home all the day, Busy in breaking up land for Wheat
Friday C.S. Otley	6	am Capt Johnson calld upon me and I walkd home with him
Saturday C.S. Overton	7	am at 11 I dischard My Man Gains for ill treating my dogs and took Groves man in his stead
Sunday C.S. Oxford	8	am at 11 performd Divine Service at 4 p.m. I dind with His Honor the Lt. Govnr. Sent Stokes and 2 Men out with my Dogs.

February 1807

Monday C.S. Parkgate	9	am at 11 engaged upon the Bench trying some Prisoners At 1 p.m. waited upon the Govnr upon some Business this day laid the foundation of my new room
Tuesday C.S. Pembroke	10	am at 11 I walkd to the Govmt farm upon business and at ½ past 3 p.m. I dind with the Lt. Govnr at the Farm walkd home with him at ½ past 7 and took tea with him
Wed. C.S. Penrith	11	am at home all the day. at 4 p.m. Lieut Laycock of the New South Wales Regt and 4 Men armd arrivd here by land from the Settlement at Pt Dalrymple. they were 9 days from the Settlement but 7 walking it the first party that have ever came from Pt. Dalrymple he came to inform this Govnr of the distress of that settlement. We can afford no relief

Thursday **C.S.** **Penzance** 12 am at home all the morn. busey at my Garden 2 p.m. I took a walk with my Gun did not kill anything

Friday **C.S.** **Laycock** 13 am at 11 I sat upon the Bench at least 20 people came there upon business, which detaind me till 4 p.m.

February 1807

Saturday **C.S.** **Perth** 14 am at 10 calld upon the Lt Govnr we took a walk till 12. this aft I Buried Robert Waring One of Mr Fosbrooks men that hunted for him, he was forced from the hut by the Natives which came in great number to him they took the man some distance from the Hut and one of the party throwd a Spear at him which entered his side. He pulld it out and on the natives going to pick it up to Spear him again, He shot the Native and killd him. They all went away and left him and with great difficulty he got to the first falls where he met with a boat which brought him to Hobart Town his death was caused by the Spears entering his side. At 4 p.m. Capt Johnson Lieut Laycock and self dind with the Govnr

Sunday **C.S.** **Petersfield** 15 am at 11 performd Divine Service attended by all the Military Lt Govnr Lt Laycock &c &c.

Monday **C.S.** **Return** 16 am at 9 I sent for Guest the Principal Blacksmith to have my churn finisd by order of the Lt Govnr he said that he had no Charcoal nor has any work been done for 9 days owing to Clark the principal burner having permission to go aKangarroing he lives servt to Richd Clark and gives him 50£ per annum Guest informd me that he should not have any ch,coal till Friday next Clark having permission to be out. at 9 Lt Laycock and his men left Hobart Town in a Govmt Boat to Herdsmans Cove. the day very hot

February

Tuesday **C.S.** **Petworth** 17 am at home all the day bust in getting my Ground hoed up the day very hot

Wed. **C.S.** **Dock** 18 am this day very hot scarce able to Stir out we have not had any rain for a very long time no grass and the Country on Fire by the Natives who were very troublesome to the men out aKangarroing--the Colony in very great distress for wheat which is six pounds per bushell and potatoes 15s per lb.
A strong Sea Breeze

Thursday **C.S.** **Poole** 19 am at home all the day a strong Sea Breeze

Friday C.S. Portsmouth	20	am at 11 sat upon the Bench to try a Prisoner which was sent in from the Farm this Eve Henry Hakin returned from going part of the way with Lt Laycock to Pt Dalrymple the wr very hot. we had a very small shower of rain this Eve—Sea Breeze strong
Saturday C.S. Prescott	21	am at home all the day at 12 Capt Johnson calld upon me 2 p.m. the Govnr calld upon me at the Cottage strong Sea Breeze

February 1807

Sunday C.S. Putney	22	am at 11 Performd Divine Service the day at home all the day till 4 p.m. when I dind with the Govnr
Monday C.S. Radnor	23	am at 11 confind Stokes my Man for insolence afterwards sat upon the Bench to try Coward and Terret for gambling on the Lords Day at home the remainer
Tuesday C.S. Ramsey	24	am at 12 waited upon the Lt Govnr and informd him of Stokes conduct. he begd of me not to punish him The distress of the Colony very great Meat 3s. 6d per lb very small fish 2/- per dozen, the flathead which are by much the most plentiful in the River. Wheat not to be obtaind at 6£ per Bushell and Barley 5£ per Bushell—Salt Pork 2s/6d and 3s per lb Potatoes 1s.6d per lb Rio Tobacco £2.10 per lb and very difficult to be obtaind. Sugar very coarse at 1£ per lb not a peice of lump Sugar in the Colony
Wed. C.S. Reading	25	am at 11 I walkd to the Farm and see my Goats at Mr. Hayses, came home at 4 p.m. the day very warm but Eve cold no rain.
Thursday C.S. Retford	26	am this morn I got my Goats home from Mr. Hayses, and went out afishing. no success, 2 p.m. His Hon the Lt Gov. come and walkd in the garden

Feb. 1807

Friday C.S. Ringwood	27	am the day very windy. Williams appointed stock keeper whose brother is a magistrate at Malborough in Wiltshire
Saturday C.S. Ripley	28	am at home all the day Mr Fosbrooks and Shipmans Kangarro Hunters drove in by the Natives they took the Kangarro from them. Mr. Bowdens men drove by the Natives and George Brewer speared by them. the Men left Brewer behind
Sunday C.S. St. David	1	March 1807 am at 11 performd Divine Service. this morn we had a little Rain, at home all the day

Monday C.S. Rochester 2 am at 9 Mr Harris Breakfasted with me afterwards walkd to the Farm there met all the Settlers upon business concerning a Public Road. 4 p.m. we returnd this aft my man Richardson came in from Kangarroing he brought 80 w t and left Earl and Kemp in the bush he informd me that on Saturday morn about 9 a.m. He and Earl were out with the Dogs and that the Natives to the number of 60 came down to them throwing stones and shaking their spears at them. One man came forward to Richardson and was going to spear him, but he shot him another came to Earl he killd him my men immediately made up the Hill for fear the Natives should surround them and kill them and Dogs. The two Natives

March 1807

that my men shot, the others they took away, and made a very large Fire for the purpose of Burning the dead. the Natives have been very troublesome for a long time, but not so desperate as lately, no doubt but they have killd Brewer. The Natives endeavour to keep the Men and Dogs in the vallies that they may throw stones at them which they do with great force and exactness

Tuesday C.S. Romford 3 am at home all the day collecting some seeds—Garden seeds. Waited upon the Lt Govnr—

Wed. C.S. Romsey 4 am at home all the day 7 p.m. Lt. Henderson came down the River and gave infermation that a ship was seen coming up the River. 8 the Lt Govnernor sent a Boat down at 9 it returnd saying that they could not find one, it cast a general damp upon the whole Colony

Thursday C.S. Forrest 5 am at Daylight Lieut Lord took his boat and went down the River, on going observd a Brig laying in Kangarro Bay made sail to her. at sunrise she fird a Gun the whole of the Prisoners were so rejoiced that they gave three cheers at 8 a boat came from her, with Captain Forrest who had the Sydney the Brigs name Dutches of York from India in 2 Months passage. Capt Forrest in going to India in the Sydney had the Misfortune to run his ship upon a Reef of Rocks lost the ship and Himself and 49 men took to the launch and long boat and with difficulty in 49 days reach Amboina, at 1 p.m. I went on boat the Dutches of York 3 Capt Forrest and self came on shore and at 4 Capt Johnson Forrest and self dind with the Lt Govnr.

at 7 she made sail to come into this bay
at 10 she arrivd (?) and saluted with 11 guns

March 1807

Friday C.S. Arrival 6 am at home all day the people employd in getting things from the ship at 5 p.m. I dind at Lt Lords but was very unwell was obliged to come away very early

Saturday C.S.	7	am at 9 took a walk with Capt. Johnson and Forrest 12 the Govnr and self with Mrs P. went on board Capt Forrests ship and took Tiffin. We stayd there some time. a quantity of spirits was landed and almost everybody was drunk
Sunday C.S. Rugby	8	am at 11 the Lt Govnr and self with Capt Forres took a walk Divine service was not performd—
		unwell that I could not dine at Capt Johnson
Monday C.S. Rye	9	am this day a quantity of spirits was landed I got 223 gall from the ship and many things unwell that I could not dine at Mr Bowdens
Tuesday C.S. St Albans	10	am at 11 I went on board the Dutches of York, 5 p.m. Capt. Johnson Lt Lord Lt Breedon Capt Forrest Lt Rankin Mr Fosbrook Mr Janson and Mr Bowden dind with me

March 1807

Wed. C.S. St. Ives	11	am at 1 p.m. Mr Bowden and self went on Board. at 5 p.m. I dind at Mr Fosbrooks and met the same party
Thursday C.S. Saltash	12	am at home all day
Friday C.S. Salthill	13	am this morn I took a long walk with my Gun at 5 p.m. I dind with Mr Janson and met Mr Fosbrooke Bowden Lt Lord
Saturday C.S.	14	am at home writing 2 p.m. waited upon the Govnr
Sunday C.S. Selkirk	15	am Divine Service was not performd, being busy in clearing the Ship at 10 p.m. we had a fine Shower of Rain which we had not had for 5 months in the Eve I hurt myself violently with a fall from my steps of the Door

March 1807

Monday C.S. Shaftsbury	16	am very ill all Day
Tuesday C.S. Dublin	17	am St. Patricks Day the Colours were hoisted on Hunters Island very ill till the day with a pain of the side from my fall. Lt Govnr sent frequently to know how I was—
Wed. C.S.	18	At home all the day very unwell

Thursday C.S. Sherborne	19	am at 7 the Dutches of York moved out into the fair way, at 9 I went on board to get my tea cheanged &c. came on shore at 11 very unwell at 4 p.m. a disturbance arose among the following Prisoners and the Military Patrole Jame Cole Tho Salmon Benjn Blackford, James Butler Wm Smith Wm Marsh, Finch Harrison Jas Parnell Wm Leach James Campble they were all secured and confind in the Guard House
Friday C.S. Dispatch	20	am at 11 I sat upon the Bench and tryd the above Prisoners those markd 200 each and the others (but Blackford) 100 each. at ½ past 5 p.m. a signal was made that a ship was coming up the River and she anchord H.M. Brig Estremona Lt. Symonds from Pt. Jackson The Govnr took my letters for England.

March 1807 V.D.Land

Saturday C.S. Simmonds	21	am at 11 calld upon Mr Lord 12 went on board H.M. Schooner Estremona Lt. Simmonds the Prisoners were all punishd but Salmon who was drunk at 9 a.m. Sergt Thorne was upon Duty at the Guard House and he informd me that he had just taken a bottle of spirits from Marsh one of the prisoners, who was supplying those who were confind in the Guard House
Sunday C.S. Dutches of York	22	am Divine Service could not be performd by reason of the people being employd in taking Stores from the Estremina ½ past 11 the Dutches of York Saluted with 11 guns and made Sail for Pt. Dalrymple. 1 p.m. his Honor the Lt. Govnr calld at my House and invited me to dine with him 4 p.m. we dind
Monday C.S. Patterson	23	am at 11 I went to Court and tryd 3 Prisoners acquitted them. 1 p.m. calld on Capt Johnson Lt Simmonds there.
Tuesday C.S. Townson	24	am at home all the day on business Capt Johnson and Lt Simmonds calld upon me

March 1807

Wed. C.S. Shooters Hill	25	am 11 Mr. Fosbrook calld upon me and sat some time 12 Capt Johnson and Mr Bowden came and stayd till 2 p.m. I took a walk on my return was informd a ship was coming up the River.
Thursday C.S. Sidmouth	26	am at 11 I waited upon the Govnr we had a very fine shower of Rain which we have not had for these five months—1 p.m. took a walk with my Gun returnd at 3 p.m. the Govnr sent for me respecting some spirits which had been savd by the Patrol. Came up and anchord off the coast the bound for Sydney Ferret Whaler from off the

coast New Zealand she had very bad success the weather was so bad Just before he made for the Derwent he fell in with a ship the Two Brothers from England 5 months 10 days

Friday Good Friday C.S. Skipton	27	am at 11 performed Divine Service waited upon the Govnr. 4 p.m. Capt Skelton calld 5 I dind with the Lt. Govnr and Capt. Johnson Capt Townson of the New S. Wales Corp Lt. Simmons Lt Lord
Saturday C.S. South	28	am this morn the Court met according with being adjournd, but on account that Mr. Bate not being present deferrd till Monday next at 9 a.m.
Sunday C.S. Stains	29	am at 11 performd divine Service. I had the New Surplice for the first time—
Monday C.S. Stanford	30	am this morn at 9 the Court met and Mr Fosbrooke, Mr Janson, Mr Bowden and Mr Power the Court sat till late upon the business I dind at Mr Bowdens in the Eve Mr Collins arrivd with the Govnr Hunter Schooner
Tuesday C.S. Collins we would not a fine rain	31	am this morn the Court met again and the proceedings were sent to the Lt Govnr he was dissatisfied with them and requested that the magistrate would alter their opinion in sending Mr Power to Sydney

April 1807

Wed. C.S. Stanley	1	am at 11 the Lt Govnr sent for me and requested I would take the depositions of John Downs and Manby respecting the sheep stealers ½ past one the following Prisoners went on board His M. Schooner Lt Symonds to take their trial at Sydney Lush Sheep stealer Jones killing a bullock Wright setting fire to Mrs Peters House this aft Richardson went out aKangarroin for me and took 4 of my Dogs and a Gun
Thursday C.S. Simmons	2	am at 7 I got into my boat and with 4 hands went down the River afishing at 4 p.m. returnd with one Dozen Cray fish this morn Early sailed H.M. Brig Estremina Lt Symons for Pt Dalrymple Capt Skelton calld upon me in the Eve.
Friday C.S. Stanmore	3	am at ½ past 10 the Lt Govnr sent for me upon Magistrate business at 1 p.m. sent my men down the River to get Cray fish at home all day in the morn Early the Mountain was covd with snow

Saturday C.S. Stilton	4	am the Wind blowing hard in the morn Early my men came home with out any Cray fish
Sunday C.S. Stone	5	am at 11 performd Divine Service 2 p.m. the Lt Govnr went in his boat round the Ferret Capt. Skelton
		April 1807
Monday C.S. Stowe	6	am at home all the day upon Business
Tuesday C.S. Stroud	7	at home all day am ~~at 9 I walkd to~~ the Government Farm upon Business and the Lt Govnr sent for me Job Stokes was this morn tryd by a Court Martial for Theft and was turnd over to the Civil Power. at 4 p.m. the Lt Govnr sent for me
Wed. C.S.	8	upon the business
Thursday C.S. Swansea	9	at 8 Capt Skelton Breakfasted with me ½ past I sat upon the Bench and took the Depositions respecting Job Stokes at 3 p.m. it was over and the Prisoner and witness went on board the Ferret Capt Skelton at 5 the Ferret saild 5 p.m. much lightning 11 the wind increased very much and continued all night
Friday C.S. Tavistock	10	am the wind blowing very hard all the morning Early at 11 I went to Court and Tryd the following prisoners Wright and Rapheal Hannah Edwards Patrick Plunket I sent for MacAllenon into the Court and desired him to repair the Road opposite his House after the court was over I went to see the Street, and desired MacAllenon to repair a part by the Paling as he had brought the Stones there I desired him to cover them over with mould or to take them away, he put his hands into his pocket lookd at me and laughd and said he would not do it at which McCarty being with me I desird him to be confind. I went home and wrote an order and gave it to McCarty the principal of the night watch Sargt James McCarty was with me all the time. at 2 p.m. I waited upon the Lt Govnr and informd him of McAllenon Misconduct and requested that he would punish him he said he would, the same Eve when McCarty went for orders the Govnr said that he would punish him
Saturday C.S. Taunton	11	Upon business all the Morning trying Prisoners MacAllenon confind

Sunday C.S. Tenby	12	am at 11 performd Divine Service the Military did not attend. at home all the Day
Monday C.S. Thetford	13	am at 11 I walkd to the Govmt Farm come home at 2 p.m. shot some Wattle Birds

April 1807

Tuesday C.S. Thorme	14	At ½ past 10 I waited upon the Lt Govnr and spoke to him about the 6 Bushells of wheat which he gave me an order for from Mr. Clark he said that all the wheat should go through Mr. C. hands and requested I would have it from him which I said I would. I then said to the Govnr that McAllenon was in the watch house he said yes has he not written to you. I said yes, but that it was too pointed an insult that I could not look over, and that I laid it before him as the Lt. Govnr to whom I look for redress. The Govnr said that he was in hopes that I had forgiven him as he was getting forward, now, better than he has for some time, but Sir I will punish him with 25 lashes and the Govnr said. And. I have to observe that this morn the Govnr punishd Plunket with 300 lashes for fighting with the M in the Eve went out to McCaleys.
Wed. C.S. Tiverton	15	am this morn took a long walk with my Gun and killd some Wattle Birds

April 1807

Thursday C.S. Tooting	16	am at home all the day. 1 p.m. the Lt. Govnr paid the Royal Marines a second payment since they came from England 1803

April 1807 [Blank page here]

Friday C.S. Totness	17	am at home all the day upon business till 1 p.m. when the Governor sent for me to settle the Business between Mr. Isat Nichols of Sydney and Foker and George Robinson my Men came home from Kangarroing and hid one in the Sails of the Boat, and I took it away.
Saturday C.S. Truro	18	am at home all the day. Busy in the Garden, the weather very cold. This morning saild the Government Hunter Schooner for Cape Barron after seals
Sunday C.S. Wells	19	am at home all the morning 2 p.m, Cap Johnson & Lt Lord calld upon me. this morn we were informd that a ship was in Frederic Henry Bay she was seen standing in by

Mr Hapley
Mr Harris
Mr Bate was detaind a little time by the Patrol because they could not give the Counter Sign

some of the Prisoners that were aKangaroing at 9 My Man Richardson came home having been absent 19 days. He gave information that the Natives had nearly killd him and Dogs. the Govnrs People were out and fell in with them when a Battle ensued and they Killd one of the Natives. the Natives killd one of the Dogs it is very dangerous to be out alone, for fear of them. they are so hardend that they do not mind being shot at.

April 1807

Monday C.S. Arrival 20 am at 11 I waited upon the Govnr. Capt Johnson was with him, as I went into the room Mr. Bate and Mr Harris came out, The Govnr Informd me that Russell (a free man) was to be tryd for breaking into John Wilkin-sons House. and that Smith a Prisoner that Mr Bate had confind was in the Watch House. The Govnr informd me that both Mr Bate and Mr Harris told him they would never send for the C. Sign either to me or to Lt Lord. the orders are that nobody should pass without it. he further said that Mr B. would not come into court and deliver his complaint in confining the Prisoners. When I went to Court I desired McCarty to inform Mr Bate that I was setting, and if he had anything to bring forward respecting the Prisoners he had confind I would attend to it. Mr B. said he did not know there would be a Court that morn but he would come directly, he came and delivd his Deposition. at 7 p.m. a strange Boat came up the River, and brought the Cap of the Ship Aurora which lays in Frederic Henry bay. 11 Mr Bate was confind in the Guard House by Rey one of the Royal M. and a Patrole on Duty. the Eve very cold. A cask of Pork and 12 Bushells of wheat was found planted in the Bush near Mansfields a Settler who came and gave information of it to the Govnr who sent men and seizd it

Tuesday C.S. Moorick 21 am at 9 the weather very cold blowing hard from the N.W. with Rain. At 3 p.m. Thunder from the N.W. at home all the morning busey in my Garden preparing ground for Cabbage Plants &c. much rain in the Eve.

Wed. C.S. Milford 22 am this morn after Breakfast I took my Gun and a Man and walkd to Peters Farm which I had not yet seen before shot some wattle Birds in the Eve wind Blowing hard. Sow'd onion seed this day—

April 1807.

Thursday C.S. St George 23 am Blowing a Gale of wind this morn at home all the day. the Barn that Nichols valued at Capt Sladens for £350 was blown down. the barn cost Capt S. £30 and that paid in property at a great price.

Friday C.S. Uxbridge	24	am this morn waited upon the Govnr and afterwards Sat at Court. The day very cold. 8 p.m. a party of the Patrole went across the river to take the bush rangers but Blackford gave them information of their coming.
Saturday C.S. St Helens	25	am the morning very cold at 10 the Govr sent for me and shod me a letter which Mr Fosbrook had found of a most alarming nature of Robbing the Stores and if detected to set fire to the thatch. Afterwards I sat upon the bench and tried Coller Blackford Cammel 3 of the Boats Crews who went and gave information to the bushrangers the Eve before that they were after them—the day very cold and blowing hard from the N. West, at home all the aft sowd Turnip Seed.
Sunday C.S. Wakefield	26	am The morn very cold and blowing hard from the N. West at 12 I waited upon the Lt. Govnr respecting the Letter which was found 2 p.m. a Military Guard was placed upon the Island. 4 p.m. I dind with the Lt. Govnr.
Monday C.S. Walden	27	am this day blowing a Gale of wind at home all the day busey in the Garden in the Eve do Wr—
		April 1807
Tuesday C.S. Ware	28	am the wr very fine after the Gale at 9 sent for the Bakers and reduced the price of Bread a fine Loaf 2 lbs for 4s before 5s afterwards walkd to the Gvmt Farm killd 6 wattle Birds, sowd Parsely seed the Eve Rain, sent my men out after crayfish to Brown River
Wed. C.S. Warwick	29	am The Morning very fine after the rain. At home all the morning Lt. James MacCauley went out to try his New Bitch. my men came home with Crayfish some very large about 3 Dozen and some Perch
Thursday C.S. Whatton	30	am at 11 I sent the Lt Govnr some Crayfish Capt Johnson and self took a long walk 1 p.m. very fine Rain
		May
Friday C.S. Welford	1	am at 11 upon Business and afterwards calld upon the Lt Govnr. the Aurora whaler came and anchord in Ralphs Bay Cap Merrith
Saturday C.S. Wells	2	am at 12 waited upon the Govnr at home the remainder of the day planting cabbages and sowing seeds after the Rain Lt Lord and Mr Bowden went on board the Aurora
Sunday C.S.	3	am Divine Service was not performd the wr being very uncertain for Rain This Eve came home my Dog Ponto who has been absent since the first of April

Monday C.S. Weymouth	4	am upon business all the morn afterwards busey in the Garden at
Tuesday C.S. Whitby	5	am this morn I waited upon the Govnr who was very ill. 1 p.m. I Xnd Sergt Thorns 2 children Lt. Breedon stood for one. at home all day getting my new rooms Tiled &c &c and busey in the Garden ½ past 8 Rain.
		May 1807
Wed. Whitby	6	am at home all the morning in the Eve I went out and at ½ past 11 three men with their faces blackd came to my House and was challenged by Moffart my man, they went away
Thursday C.S. Wilton		7 and at 3 a.m. came again when Moffat shot at one of them Chishole the Patrole see the three men but could not get them. at home all the day at 11 p.m. some men came again when my three Men went out but the Night was so dark they could not see them. Capt. Johnson and Mr Lord calld upon me
Friday C.S. Windsor	8	am at 7 this morn Mr. Blinkworth a Settler came with his Six Men sowd and chippd in 2 acres of wheat at 11 calld upon the Govnr and tryd Ann Benchs for taking an apron sentenced her to six Months to Govmt Work. Mr Blinkworth dind with me busey all the day after the men at 7 Mr. Blinkworth man was confind in the Guard House by Capt Johnson I went to him and had him liberated
		May 1807
Saturday C.S. Witney this day I finished all my wheat and a little Barley	9	am at home all the morning busey with the Men sowing and Chipping in the wheat and sowd some Barley at 11 information that a large ship was standing up the River this day I gave McCauley 4 acres of Ground to cultivate at 7 p.m. anchored in the Bay the Elizabeth whaler Capt Bunker from Pt Jackson belonging to the House of Bennet and Co London she was from England 18 months has been off the coast of New Zealand
Sunday C.S. Bunker	10	am at 12 calld upon the Lt Govnr. at 2 p.m. Capt Johnson, Lt. Lord Capt Bunker & Capt Meerick calld upon me.
Monday C.S. Supply	11	am at home all the morn 5 p.m. I dind with Mr. Janson met Mr. Harris Bowden Fosbrook Lt. Breedon
Tuesday C.S. Woodbridge	12	am at home all the day busey about my Garden and House

Wed. C.S. Woodstock	13	at home all the morning 5 p.m. Capt Johnson Lt Lord Capt Bunker Capt. Merrith Mr Janson Mr Bowden Mr Fosbrook dind with me

May 1807

Thursday C.S. Worcester	14	am at 10 I went to the Island to see some Pork condemned
Friday C.S. Wye	15	am employd upon the Bench all the morn afterwards at home busey in the Garden planting
Saturday C.S. Yarmouth	16	am This morn the Govnr sent for me to try Garret a prisoner for purchasing stolen Property from the ship Elizabeth Capt Bunker at 1 p.m. I went on board to take some refreshment with Capt. Bunker. the Night very cold
Sunday C.S. York	17	am at 12 I waited upon the Lt Govnr the day very cold and the mountain was covd with Snow. In the Eve Mr & Mrs Groves drank Tea with me
Monday C.S. Wymondham	18	am this morn busey upon the bench. At 12 I waited upon the Lt Govnr Captain Bunker and Capt. Merrick calld upon me Xtaind Mr Blinkworth little Girl Capt. Johnson went down the River saild the Elizabeth Capt, Bunker to Frederic Henry Bay a whaling.

May 1807

Tuesday C.S. Queen Charlotte	19	am at home all the Day sowing Barley in the Mr & Mrs McCauley came to live at my House theirs under repair at 2 p.m. Mr Janson & Mr Bowden calld upon me
Wednesday C.S. Camden	20	am at 12 waited upon the Lt Govnr at 1 calld upon Mr Bowden
Thursday C.S. Dublin	21	am this Morn Lt Lord and self had a dispute respecting the stock at 12 I waited upon the Lt Govnr whom Lt Lord said he would mention what passed, the Govnr sent for him and we made it up there
Friday C.S. Moira	22	am upon business all the morning. Mr Harris and Mr Hopley attended having confind two prisonrs for Laughing at them, the day very wet. at home all the aft Capt Johnson returnd from down the River
Saturday C.S. Wentworth	23	am This morn I got up very early to shoot Wattle Birds found only one, which I killd at 1 p.m. calld upon Capt Johnson and meet Capt Merreth and Lt Lord at his House
Sunday C.S. Howick	24	am at home all the Day, the mountain covrd with Snow and a very severe frost this morning

Monday C.S. Erskine the 1st whale killd by a Mr Bunker	25	am this morn the Lt Govnr sent for me to settle the business between Henry Hays and Edward Miller free settlers respecting the damage that Millers Piggs had done to Martha Hays corn which was settled to the satisfaction of all parties and approved by His Honor the Lt. Govnr. At home the remr of the day.
		May 1807
Tuesday C.S. Althope	26	am at home all the Day busey in my Garden.
Wed. C.S. Lansdowne	27	am at 11 the Lt. Govnr sent for me upon business at 1 Mr Bowden calld and stayd till late.
Thursday C.S. Lennox	28	am at 11 calld upon Mr. Fosbrook and Mr. Janson afterwards killd some Wattle Birds.
Friday C.S. King	29	am at 9 I breakfasted with Mr Bowden and we walkd to his Farm to see his stock about 5½ miles from Hobart Town they were out at a distance near Faulkerners distance from Hobart Town 7½ or 8 miles. We returnd home to dinner at 5 p.m. the Eve very wet and blowing hard
Saturday C.S. Success	30	am blowing very hard at 11 the Aurora and Elizabeth anchord near the town blowing so very hard 12 I waited upon the Lt Govnr and in the aft Capt Merrick and Capt Bunker came up to Hobart Town.
Sunday C.S. Sidmouth	31	am at 7 Capt Merrick went on board the Aurora and at 11 seeing a whale he went after it with only one boat he struck her and when she rose again he put another Iron into her, she then turned and struck the boat and stove it, that they were obliged to cut the ropes, which held the whale the boat filld so fast that they were obliged to hang on their oars in that dreadful state they continued 5 hours One man was knockd over when the whale struck the Boat and went down at 1 p.m., another one of the men died in the Boat and at 2 another died. Capt. Merrick and 2 Men continued in the Boat with the water up to their waists till a boat from the Elizabeth came to their assistance and when they arrived they were very near going down they were 5 hours in the water expecting every moment that the Boat would part with them—and had not the Boat fortunately arrived every soul must have perishd as they were so deep in the water and they began to be stiff with the cold water

Monday 1 June 1807
C.S.
Aurora

am at 11 the Lt Govnr sent for me and requested that I would bury 2 Men from the Aurora Capt Merrick, at 12 4 Boats came up the River 3 from Capt Mc. and the other from Capt Bunkers towing the bodies of the deseasd in the Bd they landed at the Waff and the Bodies were attended to the Grave by Capt Merrick as chief morner and Capt Bunker Mr Collins and the crew of both ships &c Capt Johnson Lt Lord G. P. Harris Esqre. at 1 p.m. the corps was put into the ground afterwards we all went to Lt Lords and took refreshment when Capt Merrick informed me of the melancholly sceine which took place he said that when he struck the second Iron into the whale that she came up and in cutting her flukes off she went down rose immediately and cut the stern of the boat off one man immediately went down they then cut the stear oar in halves and keept padling with it by which means Capt M. and his boatshearer preservd their lives.

June 1807

Tuesday 2 am at home all the Day this my Birth day aged 44. In the
C.S.
Spencer

Eve I gave my men Spirits Shaffart made me a very excellent Cake with the Letters upon it The Rev. R. K. Capt Bunker in the Elizabeth sald for Frederic Henry Bay.

Wed. 3 am at home all the Day the wr very cold. Capt. Merrick
C.S.
Pole

in the Aurora a whaler saild for Frederick Henry Bay whaling

Thursday 4 am at 8 The Colours were hoised on Hunters Island at 1
C.S.
King George

the Royal Marines fired three Vollies and a Royal Salute was fird from the ordinance. 5 pm Capt Johnson Lt Lord Lt. Breedon and self dind with His Honor the Lt. Govnr and a very Excellent Dinner we had The morning there was a very severe frost the Ground I never see so white before, the Day very cold and evening

Friday 5 am very unwell with a bad cold 2 p.m. Capt Johnson calld
C.S.
Clarence

upon me The Eve very cold

Saturday 6 am The morning a severe frost at home all day very
C.S.
Kent

unwell The Lt Govnr sent to know how I was

Sunday 7 am The morn very fine, at home all the Day unwell.
C.S.
Sussex

June 1807

Monday C.S. Sophia	8	am at 11 I sat upon the Bench to try Salmon and Davis for cutting Broderic a man of Mr. Collins no proof against them I liberated them—unwell
Tuesday C.S. Russell	9	am at home all the day ½ past 11 p.m. Sargt McCauley with a party of Royal Marines went down to Ralphs Bay in search of the Bush Rangers infermation had been given to the Lt Govnr that they were at the Lime Burners by Capt Johnsons servt with whom they were with the day before, and they robbd the boat of everything and put her afloat.
Wednesday C.S. Sheriden	10	am the morning very fine but cold at 1 p.m. calld upon Mr Fosbrook afterwards took a walk at 7 Wolly one of the Marines that went away with Sargt McCauley returnd to my house and informed me that he had landed the party below the Charcoal Burners
Thursday C.S. Minto	11	am at home all day the Wr very cold. Mrs. Bean came to work for Mr McCauley
Friday C.S. Sullivan 2 loafs of Bread	12	am the Morn evry fine at 1 p.m. I went across the River and at 5 returnd to Dinner. 7 Sargt McCauley returnd from after the Bush rangers and unsuccessful the information that was given to the Lt. Govnr was void of foundation. Capt Johnsons man Brown see them and supplied them with Bread and rice

June 1807 V. D. Land

Saturday C.S. Carysfort	13	am at home all the day information was given that a ship was come into the river and anchord in Storm bay Passage
Sunday C.S. HUMPHREY	14	am at 12 Mr. Humphry landed from the Albion whaler Capt Richardson at home all the day at 7 p.m. Mr. Humphry call upon me
Monday C.S. Albion	15	am very unwell at 6 p.m. I dind with Lt. Lord to commemorate his Birthday and met Capt Johnson Lt Breedon Mr Janson Mr Bowden Mr Fosbrook G. P. Harris Esqr at 9 I came away so unwell
Tuesday C.S. Temple	16	am at home all the day unwell Lt Lord calld upon me—
Wed. C.S. Albemarle	17	am at home all the day the wr very cold

Thursday C.S. Townsend	18	am at home all the day very unwell
Friday C.S. Bond	19	am at home till 5 p.m. then dind with Mr Janson and met Lt Lord Mr Humphrey Mr. Bowden Fosbrook Harris Lt Breedon very cold and severe Wr
Saturday C.S. Garrow	20	am took a walk to the Farm with Mr Bowden he came and took refreshment before we went out

June 1807 V.D.Land

Sunday C.S. Deal	21	am the wr very cold I have been unwell since the 2nd June at 5 p.m. dind with Mr. Bowden and met Capt Johnson Lt. Lord Lt Breedon Mr Fosbrook and Mr Humphrey came home at 8 very unwell, a very severe Frost this Eve—
Monday C.S.	22	am The morn very Severe Frost upon business all the morn Mrs McCauley very unwell, at 2 p.m. Mr & Mrs Blinkworth came to see her, dind and stayd all night Mr Fosbrook Mr. Janson calld upon me. I calld upon Mr Lord. Mr Bowden cald and took refreshment
Tuesday C.S. Hythe	23	am This morn Mr Fosbrook and self calld upon the Lt. Govnr afterwards upon Lt. Lord with Mr Fosbrook in the Eve very severe Gale from the S. West This day finished 2 Beds of early Potatoes.
Wed. C.S.	24	am blowing very hard at home all the day not well
Thursday C.S. Weldon	25	am Mr. Bowden came to see me the wr very cold went to Mr Collins on business at a Quarter past 10 p.m. Lieut Ranking of the 75 Regt. departed this life, he came from India with Capt Forrest and went to Sydney from hence and returnd with Capt Bunker to take his passage to England.
Friday C.S. Wellow	26	am this morn upon business on the Bench tried Plunket and Wasey two Bushrangers came in this morning early sentenced each 400 Lashes
Saturday C.S. Matloch	27	am 11 I went with the Govnr to attend the Punishment of Plunket and Wasey and 3 more men for neglect of Duty. 2 p.m. I Buried Lt Rankin of the 75 Regt. the Lt Govnr Lt. Lord Mr. Janson Mr. Bowden and Mr Collins attended the Funeral carried by 6 Marines

June

Sunday C.S.	28	am at home all the morning 4 p.m. I dind with the Lt Govnr the day very cold

Monday C.S. Warwick 29 am at 12 a court of Inquiry set upon the conduct of Mr. H. by order of His Honor the Lt. Govnr the following members sat Capt. Johnsom Lt. Lord Rev. R. K. Mr. Janson Mr. Bowden at ½ past 3 the court adjourned till I sat upon the Bench to try some bush Rangers

Tuesday C.S. Hull 30 am at 12 a Court of enquiry sat by order of His Honor the Lt Govnr to inquire into the conduct of Mr H wich took place at St Thomas on the 21 inst. Capt Johnson Lt Lord

[Here one page is cut from the original Diary]

July 1807

Wed. C.S. Fenton 8 am at home all the day. the Weather very fine at 8 p.m. some men came to take away my Dogs as supposd some of the Stock

Thursday C.S. Tyne 9 am the wr very fine this morn at home all the day at ½ past 10 Russell and Tomlins were fird at by Mr Lightfoot &c &c

Friday C.S. Stourbridge 10 am this morn Sargt McC brought me a Pipe which was found by some of the military. at 11 I waited upon the Governor afterwards sat upon the Bench to try Mr Bates Man in the Eve, drank tea with Mr & Mrs Groves, Mr Bowden calld upon me

Saturday C.S. Nevil Marsh absented himself from the Colony 11 am at 11 Mr Bowden calld I took a long walk to the Farm and killd a Couple of Ducks came home to Dinner. the day very fine at 12 p.m. some Theves went to Mr Fosbrook they were disturbed by the Patrole

Sunday C.S. Kendal 12 am at 4 I was disturbed by some Theves who were attempting to get into my house my Man Shaffart heard them but the morn was so dark we could not see them, at home all the morning 4 p.m. I dind with His Honor Lt Govnr Collins we had some rain

July 1807

Monday C.S. Woodford 13 am at home all the day, at 9 p.m. McCartys men were stopd by the Patrole and confind in the Guard House. when the Patrole went to the Boat which laid off Hangans Farm, they found 9 Kangarros and 2 Emews in it which they left it.

Tuesday C.S. Preston 14 am at ½ past 10 I went upon the Parade and at 12 walkd home with the Lt. Govnr upon business this day very fine, busy in the Garden planting and sowing seeds. this day I had information that my men were going to take my Dogs away

Wed. C.S. Stowe	15	am The morning very foggy at 11 it cleared up at home all the morning Mr. Bowden came and bled C employd all the day in the Garden in the Eve I was taken very ill 4 p.m. 3 large whales were opposite my house
Thursday C.S. Buckden	16	am at home all the morning upon business taking Examinations respecting Luis's Child at 2 p.m. waited upon the Govnr a very fine day

July 1807

Friday C.S. Chelmsford	17	am this morn went out with my Gun no success. In the Eve we had some rain 2 whales opposite my house
Saturday C.S. Dunmow	18	am at 11 Mr Bowden calld upon me 2 p.m. I took my Dogs out to kill a Kangarro saw one but the Brush was so thick I could not kill it returnd at 5 p.m. wet through everything it continued raining all the Eve
Sunday C.S. Bath	19	am at 9 the morn fine after the rain the Lt Govnr unwell at home all the day in the afternoon much rain
Monday C.S. Morton	20	am the day very wet and cold at home all the day G. P. Harris calld upon me, in the eve snow. I dind in my new room for the first time in vesphere postquam Mrs. P. I bat alle dicit mihi fuit ille. apud ejus domus flagulat illa ferrit ille malus
Tuesday C.S. Appledore	21	am at 9 we had moore snow than I ever see the mountain and hills near the town were coverd with it at 12 it began to rain which continued till 9 p.m. then it blew a Gale from the S.W. a very bad night of rain/and wind and Lightning

July 1807

Wednesday C.S. Wainfleet Mt Omnia	22	am in the morning Early a severe Gale of wind from the S. West a very great quantity of Rain and snow all the morn at 11 the Hills were all covered with snow. this day we had more snow upon the Hills than has been seen on the Ground the day very cold and in the eve a severe Gale of wind
Thursday C.S. Denver	23	am the morn cold and blowing a gale. At home all the Day.
Friday C.S. Wilson	24	am at Daylight I got up and took my Gun and went down to Sandy Bay after Ducks killd one and returnd to Breakfast. at 11 I transacted Business at my House which detaind me till one p.m. respecting Wilkinson and Loui's Child of 5 years and 3 months old afterwards I waited upon the Govnr and took some wine &c with him. at 9 p.m. blowing a severe Gale and rain

Saturday C.S. Weston Mr. Collin's House was robbd of property to the amount of 250£ or 300	25	am The morning blowing hard with rain till 8 when it began to clear up at 11 I went Capt. Johnson calld upon me and took a Kangaroo stake afterwards I went to his house with him. This day Hopkins servt to the Lt Govnr opend a Publick House the Sign of the Whale Fishery, and at 8 p.m. Capt Johnson Lt Lord Lt Breedon Mr Janson Bowden Humphrey and self suppd there myself in the chear at ½ past 11 we came away the wr very wet and cold

[Here one page is cut from the original Diary]

Friday C.S. Kenton	31	am at 8 the morning very cold ½ past I see many whales opposite my House. making a great noise at 12 calld upon Mr Bowden who informd me that at 8 this morn there were 17 whales counted at the same time
Saturday C.S. Pennard	1	August 1807 the morning very fine at 11 I took a walk with my Gun near Mr Millers the Settler and met with Capt Johnson and Mr Bowden. Mrs B geret male in vespere—My Bitch Miss Philis was taken by the Bush-rangers and Spott wounded by the Natives
Sunday C.S. Dunkirk	2	am the morn remarkably fine at 1 p.m. Eight Boats belonging to the Aurora Elizabeth and Albion were after whales opposite my House at ½ past they killd one at 2 they towd the whale down the River to the ships. calld upon Capt Johnson and Mr. Humphry 4 p.m. I dind with His Honor the Lt Gov Collins
Monday C.S. Bristol	3	am at 10 Mr. Collins calld upon me respecting his robbery and Examind some of the Prisoners at 2 transacted business with the Lt Govnr at 3 calld upon Lt Lord at his new house where Cap Sladden and Capt Johnson lived.
Tuesday C.S. Abbey	4	am at 10 Mr Harris and self sat upon Business at my house respecting Wilkinson. at 2 p.m. His Honor the Lt. Govnr calld upon me and took wine in the Eve I calld upon Mr Collins upon business. this afternoon Little Mary a child of 1 year old came to my House and Mrs McCauley took her, the mother being a poor distressed woman. 4 Boats after whales this day but no success
Wed. C.S. Brickdale	5	am at 11 the Lt Govnr sent for me and spoke about ironing John Clark. I calld upon Mr. Collins and met Capt Bunker Merrick and Richardson there they came up after whales. My man Earl returnd from Hunting with his shoulder bone out of joint
Thursday C.S. Reward	6	am This day at 1 p.m. a reward of Free Pardon and passage to England was offered to any Prisoner Male or Feamale who would discover the Robbery of Mr Collins so that the offenders can be convicted. was offered by the Lt Govnr. Philip Strickland servant to Mr Collins came forward and promisd to confess to me the next morning

Friday C.S. Norton	7	am The morning very wet. at 11 the Lt Govnr sent for me and requested I would take the Confession of Philip Strickland I staid with him till near 4 p.m. He implicated Tho, Wm Stoker, and P. Nowland. Maria Gardner &c &c

[Here part of one day is cut from the original Diary]

Sat. C.S. Blackdown		Killary one hour . . . according to the order the Magistrates for having committed an assault on the body of Sarah Lewis a child of 5 years old. 4 p.m. Ph Strickland was taken down the river on board the Albion Capt Richardson as some of the prisoners said they would kill him for having confessd. Mr Collins went down in the Governmen Cutter, and Mr Blinkworth
Sunday C.S. Yeovel	9	am at home all the Day this aft Mr Blinkworth returnd from the ship Albion and informd the Lt Govnr that during Saturday night or Sunday morning some person or persons had cut the Painter of the Cutter and let her go adrift from the Ship diligent search was made on Sunday by all the Whale Boats but could not be found
Monday C.S. Ludlow	10	am at home all the Day. unwell

August 1807

[Here one day is cut from the original Diary.
See also Saturday, 7th August]

Wednesday C.S. Wales	12	am at 8 the Colour were (hoisted?) in Honor of the Day. I waited upon the Lt Govnr upon business
Thursday C.S. Snow	13	am the day very cold and a very great quantity of snow fell at home very unwell
Friday C.S. Mowbray	14	am This morning the ground was coverd with Snow and all the Hills around the town The thermomiter 31
Sat, C.S. Bromley	15	am the day being very fine I took a walk and calld upon Capt. Johnson and Lt Lord, sowd raddishes &c. The Names of the Prisoners which are Bushrangers at this time and they are all armed and have plenty of Dogs James Carrot Thos Story Joseph Fernander James Watts John Williams alias Rush. Richd Grover Joseph Meyers Wm. Russell, Sam Tomlins Wm Marsh, John Brown, James Duff John Parish Wm Bowers. 14.

August 1807

[Here one day has been cut from the original Diary]

Monday C.S. Lynn at 1s/6d per lb	17	am at home all the day busy in preparing for Potatoes Capt Merrick came up and informd us that Capt Bunker was gon in his ship for to Frederick Henry Bay His Honor the Lt Govnr took in Kangarro
Tuesday C.S. Rutland	18	am this morn employd on the Bench the Lt Govnr sent for me on other business
Wed. C.S. Langford	19	am at 8 I receivd infermation that my Bitch Miss was at the Lime Burners. at 11 I waited upon the Lt Govnr and requested that Sargt McCauley might go down after her at 2 p.m. he took 3 of My men and one of the Patrole down with him

August 1807

[Here two days are cut from the original Diary.
See also Sunday, 16th August]

Sat. C.S. Aulton	22	am this morn at Reviellie Beat I got up and with my Men workd all Day planting of Potatoes the day very fine
Sunday C.S. Hafield	23	am the day very fine at 2 p.m. I calld upon Capt. Johnson. ½ past 8 p.m. I was alarmd by my Men calling out to my Dogs Hold him &c &c When I enquird what was the matter they informd me that a great noise was in the Skillion they though it was the dogs but on looking they see a Man run out from them

August 1807

Monday C.S. Sacville	24	am this Morning at Daylight my Men and self began setting potatoes and continued all the morning. when a very great quantity of rain fell. I waited upon the Lt Govnr all the afternoon and Eve wet
Tuesday C.S. Northfield	25	am This morn I sent my two Men out after Kangarro
Wednesday C.S. Redbrook	26	am at 11 I went over to Morgans Farm and took refreshment with me Came home 5 p.m. Mr and Mrs M C with me
Thursday C.S. Somersett	27	am upon business this morn afterwards Mr. & Mrs. M C and self went in my boat to Sandy Bay where we dind and returnd home in the Eve

Friday C.S. Hatton

28 am at 11 I calld upon Mr. Bowden. 5 p.m. G. P. Harris Esqr came and took a pipe with me busey in my Garden all the aft

Saturday C.S. Needham

29 am Employd all the day in my Garden Sowing Beans and preparing Ground for Potatoes

August

Sunday C.S. Dickson

The Govnr sent a Guard of Mariens on board the Elizabeth

30 am at home all the morning at 11 Capt. Merrick and Capt. Richardson came up in their Boats and infermd the Govnr that there was a mutiny on board the Elizabeth Capt Bunker, the men would not do their Duty because they had a scarcity of provisions at ½ past 3 the Elizabeth anchord in the Bay at 4 Capt Johnson and self dind with the Lt Govnr 6 Capt. Bunker and Merrick waited upon the Govnr Capt M. said that he should sail for England on Tuesday the first of September

Monday C.S. Embark

three men went into the House of John Crofts a prisoner with bags about their faces

memorandum to England

31 am at 11 Mr Collins Capt Bunker Capt Merrick and Capt Richardson calld upon me to see the Garden and Grounds which they very much liked. at 3 p.m. I waited upon the Lt. Govnr, 14 men that behaved in a very mutinous manner on board the Elizabeth Capt Bunker were landed and put into the military barrack they were Iron'd and Guard over them. at 5 oclock Capt. Johnson Merrick Bunker, Mr Harris Bowden, Fosbrook Humphry and self dind with Mr Janson at ½ past 9 we heard a shot fird, Capt. Johnson was informd by the Sgt of the Guard that Tomlins and Russell two of the bushrangers had got into Mr. Clarks stock yard, he was alarmd at the Noise of the cattle and went to see what was the cause when one of the men fird a Pistol at him. they made their escape the same night

September 1807

Tuesday C.S. Aurora

1 am busey in preparing letters for England at 11 Capt. Bunker Merrick and Richardson calld upon me. afterwards I waited upon the Govnr Capt Johnson calld

Wed. C.S. Elizabeth

2 am setting Potatoes this morn I cut some asparagus the first that has been cut in the Colony, and I believe the only bed that is in the settlement. This day I was employd in prepar letters for England and sat up till past 12 p.m.

Thursday C.S. Johnson

3 am at 4 this morn I went to bed after finishing my letters ½ past Capt Johnson came to me and took his leave for his departure for England in the Ship Aurora Capt Merrick at home all the day

Friday C.S. Craven

4 am busey all the morning at writing, I killd a very large Eagle by my pigeon house. At 2 p.m. His Honor the Lt Govnr calld upon me in the eve Mr. Evans the first mate of the Elizabeth Capt Bunker calld and took a pipe

Saturday C.S. Rye	5	am in the morn I went to Mr Collins upon business at 10 the Govnr sent for me and stay with him till 1 p.m. upon bûsiness

September 1807

Sunday C.S. Hereford	6	am at home all the morning. 2 p.m. I took a walk and observed a boat coming up the River on my return, I receivd two letters from England one from Ld Spencer and Mr. Tustin by the ship Sarah Capt Bristow who left this settlement on the 4th of August 1806 in the ship Ocean. His Lordship informd me that he had receivd 1 of the Black Swans safe by the Carlton whaler Capt Halcrow
Monday C.S. Bristow	7	am at 8 Capt. Bristow calld upon me 10 I went upon the Parade and afterwards sat upon the Bench when that was over I calld upon the Lt. Govnr who read me some English papers at 4 p.m. I dind with His Honor the Govnr and Capt Bristow dind there
Tuesday C.S. Banks Sent a letter to Ld Spencer	8	am at home awriting till 2 p.m, when I delivd my letters to Capt Bunker at 3 Mr Bate the Judge Advocate and Lt. Henderson went on board the Elizabeth Capt B. for Sydney and to take their passage to England at 4 saild the Elizabeth. This morn I finishd putting in all my Potatoes

September 1807

Wednesday C.S. Arrival	9	am in the morning very busey in planting Cabbages and lettices &c &c in my Garden. a very strong wind from the N.W. at 9 blowing a Gale from the sam qr.
Thursday C.S. Thannet	10	am very fine after the Gale employd in my Garden setting Peas and Beans and transplanting of Cabbages.

[Here part of one day is cut from the original Diary]

Friday C.S. Enderby	11	am this morn I sent His Honor the Lt Govnr 21 Heads of Asparagus. at 1 p.m. I waited upon the Govnr and we took a long walk afterwards he read to me an account of the Death of Lord Clermont. This day I received a very large Cheshire Cheese of 60 lbs from Ld Spencer and a barrel of Porter, but by some means the cask was not more than half full only 25 Gallons. Marsh one of the Bushrangers came in and the Govnr punishd him 300 Lashes
Saturday C.S. Portland	12	am at home all the day employd in the Garden the wr. remarkably fine. Powers setts his 60 Gal Cask of Porter at 30£ per Cask he had landed 300 gall Spirits in 2 Casks

Sunday C.S. Mulgrave	13	am at home all the Day

September 1807

Monday C.S.	14	This morning early I went to the Stores to put in Kangarros at 11 I sat upon the Bench and tried James Davis, Borwell for purchasing Kangarro from Mr Bowdens and Mr Harris Men and for their coming

[Here part of two days is cut from the original Diary. See also Thursday, 10th September]

. . . Afterwards I went to Millers the Settlers with Hays and returnd home to Dinner when McC went out after his first Camis et rediit vespere et amimus malus fuit. The Equinoctial Gales

Wed. C.S. Minto	16	am mene ibat sine at 11 I waited upon the Lt Govnr Mr Janson and Mr Bowden calld upon me
Thursday C.S. Maida Whe Battle was ft between the English & French under the command of Gen Stewart	17	am at 12 I waited upon His Honor the Lt. Govnr and we went on Board the Sarah Capt Bristow the owners Names Enderby of London where we took refreshment and at ½ past 3 pm we dind and stayd to Sup at ½ past 9 we came away when the ships Company gave the Lt. Govnr three Cheers Blowing hard the Equinoctial Gales continuing—
Friday C.S. Sicily	18	am at home all the day employd in the Garden. This morn I out a quantity of Grass for dinner
Saturday C.S. Sandgate	19	am the wr blowing at home all the morning sowing Pumkin seeds at 12 p.m. Mr Bowden calld ½ past 10 McCauley came home from the bush no success in finding his Bitch. blowing very hard
Sunday C.S. Gales	20	am a very severe Gale from the N.W. at 10 do wr at home all the day Sargt McCauley took Tomlins and Rush alias Williams two of the Bushrangers at Henry Hayses the Settlers at New Town

[Here part of one day is cut from the original Diary]

Monday C.S. Gloscester	21	this morning engaged upon the

September 1807

Tuesday C.S. South	22	am at 12 the Govnr sent for me on Business Captain Bristow deliverd me another Letter from Ld. Spencer. busey in my Garden in the afternoon and broke up some new Garden ground
Wed. C.S. Darnley	23	am at home all the Day busey in my Garden
Thursday C.S. Yarmouth	24	am at 11 I walkd to the Govmt Farm and calld at some of the Settlers to see their Crops of Corn, 3 p.m. I returnd home 4 I dind with His Honor the Lt Govnr at 7 Mr Grimes the Surveyor General and Lieut Piper of the New South Wales Corps arrivd at the Govnrs from Port Dalrymple. at 10 I came home the day very Windy
Friday C.S. Grimes	25	am at 11 Mr. Humphry and Mr. Grimes calld upon me 4 p.m. I dind with the Lt Govnr and met Mr Grimes and Lt Piper Lt Lord and Mr Humphrey
Saturday C.S. Piper	26	At 11 I waited upon the Lt. Govnr and we attended the punishment of 2 of the bushrangers Tomlins and Rush alias Williams. Afterwards Mr. Gromes Lt Piper Lt. Lord Mr Humphry and Mr Fosbrook came and took a Kangarro stake at my house afterwards I walkd to Lt. Lords
Sunday C.S. Montrose but it was out with the stock	27	am this morning I was informd that the heifer which the Lt Govnr gave me had a Bull Calf and at 12 I walkd to Government Farm to see it. 2 pm His Honor the Lt Govr called upon me. At 4 I dind with Mr. Fosbrooks and met Lt Piper Mr Grimes Mr Humphrey Mr Janson Lt Lord
Monday C.S. Abbot	28	am at home all the day. I sent my man to the farm for the Cow and calf, but the calf was lost Mr Clark sent me word
Tuesday C.S. Colchester	29	am at 11 I walkd to the Govimt Farm with Mr. Grimes Mr Harris to settle the road between Mr. Cockrill and Mr Blinkworth and we calld upon Mr Clark who told me the calf was not found. at 5 p.m. Mr Grimes Mr Piper Lt Lord Mr Fosbrook Mr Janson Mr. Humphrey Mr. Harris Mr. Bowden dind with me the same Eve I had infermation that the calf was found and I sent word that I should send for it in the morning

September

Wed. C.S. Montgomery	30	am at home all the morning 2 p.m. I calld upon Mr Janson at 5 I dind with Lt Lord and met the Governor. Mr Grimes Lt Piper Lt Breedon Mr. Janson Humphrey Bowden Fosbrook

October 1807

Thursday C.S. Powis	1	am This morning Early Garret and Duce took my boat and went on board the Sarah Capt Bristow and 5 men made their escape from the ship. 2 pm I waited upon the Govnr
Friday C.S. Cullen at a boat well mannd Thcs Salmon went on board the Sarah	2	am this morn said the Sarah Capt Bristow on a Whaling Voyage at 10 the sea breeze set in and was obligid to anchor at Trywork Bay at 7 p.m. the Lt Govnr sent for me on business at 11 a musquet was fird from the Sarah whaler Capt Bristow and at a Qr before 12 he fird 2 great Guns. The Govnr immediately sent a Party of the R. marines on board
Saturday C.S. Sarah	3	am at 1 Raphel and Edwards two Prisoners attempted to board the ship and were taken by the Guard which was left on board. at 6 she saild. 10 the boats left the ship 11 Mr Grimes Lt. Piper and Mr Humphry calld upon me Strong Sea Breeze

October

Sunday C.S. Wilson	4	am at 11 Mr Grimes and Mr Humphry Lt Piper calld upon me. at home all the day—Sea Breeze
Monday C.S. Moffit	5	am employed all this morning in moulding up the Potatoes at 5 p.m. I dind with Mr. Janson this morn Mr. Bowden gave a Breakfast to Mr Grimes Lt Piper Lt Lord Lt Breedon Mr Janson Mr Harris Mr Fosbrook and self The same party dind at Mr Jansons Do
Tuesday C.S. Harris	6	am Mr Grimes and Lt Piper calld upon me to take their leave prior to their going to Pt Dalrymple and at Two p.m. they with Mr Harris and Mr Humphry went up to Herdsmans Cove in my large Boat. a strong Sea Breeze
Wed. C.S. Humphrey	7	am at home all the day employd in moulding up my Potatoes

October

Thursday C.S. Blare	8	am at 8 Mr and Mrs McCauley and self went down to Browns River where we dind and returnd in the Eve. as we went down we see a great many Natives but we did not go on shore

Friday C.S. Upton — 9 am at 11 we went down to Browns River for my man Earl whom I had left the day before, and we see a great many of the Natives in the Same Place and on our return we landed amongst them the Women and Children were together and the men out ahunting at 5 p.m. they returnd and they all came amongst us between 250 and 300. they were all very friendly and we gave them presents. at 7 we got home

Saturday C.S. Sheffield — 10 am at home all the day Employd in the Garden I cut a great quantity of Asperagus five of the Sailors which ran away from the Sarah Capt. Bristow came in from the Bush

October 1807

Sunday C.S. Hartwell — 11 am this day blowing a strong land breeze at 2 p.m. My Men came down for Kangarroing and informd me of the death of my Dog Spott which was speard by the Natives some time since at 4 p.m. dind with His Honor Lt Govnr Collins

Monday C.S. Otley — 12 am blowing very hard all the day from the North. this morning Mr Shipman the store keeper was discharged ex officio I bought a new Dog from Ancors for 8£

Tuesday C.S. Gatcomb — 13 am a strong wind from the Nth at 11 I attended a punishment of Tomlins and Rush and waited upon the Lt Govnr 1 p.m. calld upon Mr. Fosbrook

Wed. C.S. Burton — 14 am the day very windy at 12 I went out afishing caught 4 salmon and some Rock Cod returnd home at 5 p.m. Mr Clark of the Govmt Farm appointed a store keeper

Thursday C.S. Selby — 15 am this morn at 11 I went out with my Gun to the Lagoons on the East side of the River but could not see any Ducks I went then afishing and a Gale came on, at 4 p.m. with great difficulty I got my Boat in at Sandy bay where I was obiged to leave it at 9 blowing a Gale of wind from the N.N.W.

October 1807

Friday C.S. Russell — 16 am this morning the Mountain was covrd with snow and we had some rain with a gale of wind. at 11 I calld upon Mr Janson at home in the garden the remainer of the day

Saturday C.S. Middleton — 17 At home all the Day employd in the Garden

Sunday C.S. Cotton — 18 am at home all the morning afterwards calld upon Lt Lord a Sea Breeze

Monday C.S. Hagley — 19 am upon business all the morning afterwards employd in the Garden a Gale of wind from the N.W. at 9 Rain which continued all night

Tuesday C.S. Dudley — 20 am the morning at 10 very moderate and clear after the Gale but a very great quantity of snow upon the Mountain at home all the day

Wednesday C.S. Nelson the battle of Trafalgar — 21 am at 11 I calld upon the Commissary (Mr Fosbrook) we walkd into his Garden afterwards dind with him and Mr Janson came soon after dinner we made a late eve.

Thursday C.S. Cavendish — 22 am this morning Mr Fosbrook Mr Janson and Mr Bowden calld upon me

Friday C.S. Powlett — 23 am Mr and Mrs McC and self went out in my boat up the River a little way

Saturday C.S. Supply — 24 am at Daylight this morning Mr and Mrs McC went in my boat to Browns river where we dind and at 5 p.m. as we were coming up we observd 2 ships standing up the river at 6 I waited upon His Honor the Lt Govnr to inform him of them

Sunday C.S. George Capt Folger — 25 am at 9 His Majesty Ship Porpose anchord in the Bay and fird a Salute of 13 Guns which was returnd by the Garrison Likewise the Topaz American ship anchord in the Bay. at 10 I waited upon the Govenor where I see Lt Simmons who commanded the Porpoise at 11 performd Divine Service.

Monday C.S. Simmons — 26 am at home til 1 p.m. when I calld upon the Lt Govnr and met Lt Simmons Doctor Townson Mr Lutteridge the Surgeon of H.M. Ship Porpose receivd 4 Boxes and a Parcel of Papers with Letters &c &c from England with a New Gun

October 1807

Tuesday C.S. Topaz — 27 am at 11 Lt Simmons and Lt Ellison calld upon me who invited me to go on board with them. I went and the wr being so bad I stayd and dind

Wed. Ellison — 28 am at home all the Day this day I got 20 Gallons of spirits from Capt Folger of the Topaz

Thursday C.S. ARRIVAL — 29 am at home in the morning sowing seeds from England

Friday 30 am at 11 Doctor Townson and Surgeon Lutterige calld upon me Lt Lord landed a Cask of Spirits from H.M. Ship Porpus without any permitt his man came past my house with it in a Barrow

October 1807

Saturday 31 am at 7 I went on board H.M. Ship Porpus and Breakfasted. 8 Mr Slone the Purser Mr Short Masters Mate. and Midshipman G. Collins and self got into the Porpus launch with 7 Man and went down the River at 11 we enterd Storm bay passage and proceded to the N.W. Port where we went after some black Swans and killd three in Lieut Lord's Boat which we borrowd to pull after the Swanns it being very light at 5 p.m. we left the Port and proceeded a little way up the Passage. The wind headed us and we anchord in a small bay. got all our things out of the boat, and dressd some dinner on Isle Brune where we slept

Sunday 1 November

At 4 a.m. we got into the boat and saild through the passage. Passed Houin Island at 7 p.m. landed on an Island next to Gardners Island where we slept

Monday 2 am at 4 Lue got into the Launch and passd Swan Port then got into the small boat and proceeded up to the Flatts the Swanns were in great abundance it came on to blow so hard that the Launch was obliged to put back and run into Swan Port at 5 p.m. we came down and at 7 landed where we got our dinners and slept there.

Tuesday 3 At 4 we Breakfasted and sent the small boat down to Swan Port and we proceeded in the Launch at 5 o'clock the Men caught 23 swans and we shot 7. at 1 p.m. the Wind came against us and we continued beating up till 9 at night when we landed

Wed. 4 am at 3 we made sail for Storm Bay Passage the wind strong against us we were obliged to go round Gardners Island. at 12 we left the Houin and anchord off the Rock and took refreshment 40 past 2 made sail but could not get forward we anchord, made a fire on shore and slept

Thursday 5 am at 3 made sail beating through the Storm bay passage at 6 it began to rain at 2 got through the passage and at 9 p.m. reach H.M. Ship Porpus. it continued raining from 6 a.m. to 10 p.m. we were all wet through. When we first set out our stay was to be only 4 days, at ½ past 9 I got home wet through everything. The Topaz saild from Storm bay passage this morn where she has laid two days through contrary winds. On my arriving home I heard the following prisoners had deserted from Hobart Town

the Speedewell schooner from Sydney commanded by McAlease laid in the Bay

November 1807

Friday C.S. Powlett	6	am at 12 I waited upon His Honor the Lt Govnr and Doctor Townson was with him at 5 p.m. I dind with the Govnr and met Doctor Townson Lieut Simmons Lt Lord and Breedon Mr Janson Mr Bowden Mr Fosbrook and Mr Collins
Saturday C.S. Carew	7	am at ½ past 11 Doctor Townson and Mr Slone the Purser of H.M. Ship Porpoise calld upon me to see my Garden and Ground I went on board and took refreshment. Lieut Ellison gave me 4 Loquet seeds which I planted as soon as I returnd

November 1807

Sunday C.S. Simmons	8	am at 5 saild H.M. Ship Porpus for Sydney at home all the day male Vespere
Monday C.S. London	9	at home all the day busily employd in my Garden
Tuesday C.S. Norris	10	am at 1 p.m. I waited upon His Honor the Lt Govnr at home the rest of the day
Wed. C.S. Brampton	11	am at 9 Mr Shipman came and measured two acres of land for me which I gave a grant to my friend Mrs McCauley at 4 p.m. Mr Shipman and Mr Chase who married the Lt Govnr Daughter dind with me
Thursday C.S. Stephens	12	am at home till 11 when I walkd to the Govmt Farm upon business at home the rest of the day
Friday C.S. Betton	13	am at 11 sat upon the Bench on business of Mr Bowdens and at 1 p.m. waited upon His Honor the Lt Govnr at home the rest of the day
Sat. C.S. Mortimer	14	am at 4 I got up and took a walk with my Gun
Sunday C.S. Marley	15	am at 11 performd Divine Service attended by the Lt Govnr &c. Mr. Bowden came home with me and took refreshment
Monday C.S. South	16	am busey upon the Bench all the morning

Tuesday C.S. Newport	17	am at 11 the Lt Govnr sent for me and requested I would make inquiry respecting some Spirits being seizd by the Patrole. I could not fix it that it was going on Board the ship therefore ordered it to be returnd
Wed. C.S. Wynn	18	am at home all the Day busey in the Garden and marking out my Land
Thursday C.S. Boxley	19	am at 11 sat upon the Bench afterwards came home and Employd in the Garden &c
Friday C.S. Brackley	20	am at 11 I calld upon the Lt Govnr who requested I would enquire of Mr Aleses conduct at Mrs C. after examining him I releasd him and reported it to the Govnr
		November 1807
Saturday C.S. Chesterfield	21	am at 7 saild the Speedewell Schooner to Sydney commanded by Mr. Alease. ½ past Sergt McCauley and one of the Patrole went on board the Schooner At home all the Day. The Govnr sent me some Prayer Books and Bibls to distribute to whom I think proper. in the Eve Thunder at a Distance
Sunday C.S. Grantham	22	am at 11 performd Divine Service attended by the Lt Govnr &c—at home the rest of the Day
Monday C.S. Wells	23	am at home all the day at 6 p.m. Sergt McCauley return from the Speedewell Schooner
Tuesday C.S. Ripley	24	am this morn at 11 I walkd to the Govmt Farm took my Gun and killd some Pigeons I bought 2 Piggs of Poteskie
Wed. C.S. Clinton	25	am at 11 Mr Humphrys friend calld upon me and dind with Mrs McCauley at 4 p.m. I took a walk to the Govmt Farm ashooting
Thursday C.S. Barkley	26	am at 8 I went in my boat to Sandy Bay and observd a Vessel standing up the River, came home and killd some Pigeons at 4 p.m. the City of Edingborough anchord in the Bay last from Port Dalrymple and brought Mr Harris from thence, she came from the Cape of Good Hope
Friday C.S. City of Edingborough	27	am at 11 I went upon the Parade and see Capt Patterson and Mr. Berry the super cargo of the City of Edingborough, she came from the Cape of Good Hope

Saturday C.S. Berry	28	am this morn I walkd to the farm and on my return I see the Lady Nelson Brig coming into the bay at 2 she anchord and brought some Settlers Men and their Wifes and Children commanded by Lieut Kent ,
Sunday C.S. Kent	29	am at 11 performd Divine Service. Mr. Berry Capt. Patterson Mr. Fosbrook Lt. Breedon came home with me and took some Bread and Chese at 2 p.m. I went on board the City of Edingborough and Lt Kent of H.M. Brig Lady Nelson at 7 we came on shore and they took a pipe with me
Monday C.S. Piper	30	am at 11 upon Business afterwards Employd in the Garden

December 1807

Tuesday C.S. Yorkton £	1	am at 11 a Man belonging to H.M. Brig Lady Nelson behaved very ill to me I made a complaint to Lieut Kent who had him punishd at home the chief of the day
Wednesday C.S. Caledon The Govnr of the Cape	2	am at home all the morning. at 5 p.m. Lieut Kent. H.M. ship Lady Nelson Capt Patterson of the City of Edinborough and Mr Berry of do and Lieut Lord and Mr Harris Mr. Fosbrook Mr. Janson and self dind at the Governors in his New House for the first time that he dind there
Thursday C.S. Grey	3	am at home all the morning between 2 and 3 p.m. we had a great deal of Thunder and Lightning and the most Severe Gale of wind from the N. West, since we have been in the settlement at 4 p.m. I dind with Mr Bowden and met Mr Berry Capt Patterson Mr Janson and Mr Harris
Friday C.S. Cornwall	4	am I receivd a box of Pines from Lieut Kent at 4 p.m. I dind with Mr Fosbrook and met Mr Berry Capt Patterson Lieut Kent H.M. Brig Lady Nelson Lt Lord Mr Har. Janson Bowden the day very squarly

December

Saturday C.S. Blyth	5	am at home all the Day 4 p.m. Lieut Kent Mr Berry Lt Lord and Messrs. Ganson. Bowden. Fosbrook. Harris. dind with me
Sunday C.S. Weldon	6	am at 7 saild H.M. Brig Lady Nelson Lt Kent for Sydney at 1 p.m. the following Prisoners who had been absent from the Colony for a very long time and had accepted the Lt. Govnrs Pardon on their returning to the settlement arrivd at Govmt House when the Govnr sent for me. Duff Quinn Meyers Grover, Story, Watts, Russell, Fernandez, at 2 I went to Mr Bowdens to take Lunch afterwards Mr Bowden and self went on boart the ship City of Edingborough where we dind

Monday C.S. Salt Fleet — 7 am at 11 Mr Bowden calld upon me in the aft I calld upon Mr Fosbrooks but did not say—I dind on board the ship the City of Edinbourgh

Tuesday Sackville — 8 am at home all the Morn. 2 p.m. Mr Harris Fosbrook Lt Lord and self dind on board the City of Edi

Wed. C.S. Bennet — 9 am at 12 Mr Bowden and Fosbrook calld upon me and we went and got some spirits from the Sd Ship

December

Thursday C.S. Glastonbury — 10 am at home all the day

Friday C.S. Hedham — 11 am I took a walk to the Farm in the morning at 6 arrived the Governor Hunter schooner from Sydney with Grain

Sat. C.S. Matlock — 12 am at 10 I took a walk with Mr. Berry and Capt. Paterson to see his men cutting a fine mast 68 feet and not a Not. Cap P came home with me and afterwards I went on board to dine I had 2 Melay fowls given me

Sunday C.S. Burton — 13 am at 11 performd Divine Service at home all the day

Monday C.S. Denbigh — 14 am upon business at the Bench all the morning Strong Gales of wind all the Night

Tuesday C.S. Gales — 15 am upon business till 3 p.m. a very strong Gale of wind at 4 the Mountain was coverd with snow the Eve very cold

Wed. C.S. Wilmot — 16 am at 8 a very strong Gale of wind from the N. West and such weather that we have not been accostomd to at this Season of the year, The mountain this morn was covd with snow at 4 p.m. the Lt Govnr Janson Bowden Fosbrook Lt Breedon Capt Patterson and Mr Berry and self dind with Lt Lord

December

Thursday C.S. Anderson — 17 am at 11 I went and examined some Beef that was landed from the City of Edinburgh at 3 p.m. I dind on board with Mr Fosbrook

Friday C.S. Crayham	18	am upon business all the morn at 3 p.m. took a walk with my Gun Lt Lord and Mr Berry took refreshment with me
Saturday C.S. Ware	19	am at 11 I went with Lt Lord to examine the Beef brought by the City of Edinburgh at 1 p.m. His Honor self and Lt Lord went to Mr Fosbrooks and eat a peice of it
Sunday C.S. Silkirk	20	am at 11 performd Divine Service at 4 p.m. I dind with the Lt Govnr the day was very hot
Monday C.S.	21	am the morning very hot with a North Wind blowing fresh I waited upon the Governor at home the remainder of the Day
Tuesday C.S. Morwood	22	am at 11 I waited upon the Lt. Govnr and at 12 Mr Harris and self went on board upon business where we dind and a day of continuel rain
Wed. C.S. Bath	23	am at 11 I went on board to settle with Mr Berry at home all the day
		Dec. 1807
Thursday C.S. Halifat Xmas Eve	24	am at 11 upon business for Mr Harris. 4 p.m. Mr H dind with me and stayd the Eve and Mr Berry call upon me
Friday C.S. Xms Xmas Day	25	am at 11 performd Divine Service attended by Lt Govnr Collins &c &c and the whole of the Service was performd and for the first time I read the Prayers out of the New Prayer Book and Bible presented to the Colony by His Majesty King George the Third at 4 p.m. Mr Berry and self dind with the Lt Govnr
Saturday C.S. Ord Sarah	26	am upon business all the morning at 9 Mr. Humphrey came from Pt Dalrymple He walkd it to Herdsmans Cove in three days. at 4 p.m. the Govnr calld upon me ½ past Mr Bowden and self went on board the City of Edinborough in the eve Mr. B. smoakd a pipe with me and at 9 calld upon Mr Humphry. McCauley sent the little girl away that he keept
Sunday C.S. Leeds	27	am at home all the morning 5 p.m. I dind with Mr Bowden and met Mr Humphry
Monday C.S. Dunkirk	28	am at home all the morning This afternoon I began Harvest. Saild the City of Edinborough for Sydney very busey at the Govt Farm in Harvest

R

Tuesday C.S. Darlington	29	am at home all the morning busey in harvest 3 p.m. I took my Gun and went out with the Dogs to kill a Kangarro but could not find any. the wr very fine
Wed. C.S. Harley	30	am at home all the morn busey in Harvest in the eve took a walk with my gun did not kill anything
Thursday C.S. Oliver	31	am this morn I finishd cutting Barley at 12 I went across the water to shoot pigeons and sent my men afishing I killd 5 and the men caugh some very fine Rock Codd
Men came in	Duff Quinn Meyers Grover Story Watts Russell Fernander	

January 1808

Friday C.S. New Year	1	am The morning very hot at 11 His Honor the Lt. Govnr and Lt. Lord calld upon me, I walkd with them to Govmt House where we took wine afterwards I went to Mr Lords and Named His Child I gave my men Spirits &c to welcome in the New Year
Saturday C.S. Morgan	2	am at home all the morning the Lt Govnr went to Morgans Farm across the water—at 3 Mr & Mrs. Mc and self went up the River near the Govmt Farm where we dind
Sunday C.S. Louth	3	am at 11 performd Divine Service attended by all the military and most of the Civil officers—at home all the day
Monday C.S. Bowden	4	am when walking out this morn the Govnr met me and we took a walk and afterwards I took refreshment, at 2 p.m. Mr Harris calld upon me
Tuesday Hinton	5	am this day Mr & Mrs Mc and self went to Mich Mansfields the day very wet and came home late.

January 1808

Wed. C.S.	6	am at home all the day very busy in Harvest cutting wheat
Thursday C.S. Princess of Wales	7	am very busey in Harvest the Govnr calld upon me, and I went home and took wine with him this aft I finishd cutting my wheat gave the men Spirits &c

Friday C.S. Tenbury	8	am at 11 I sat upon the bench the Lt. Govnr sent for me the day very hot at 20 past 3 p.m. the Thermomiter 99 in the Eve the wind changed from the N. to S. when we had rain
Sat. C.S. Brentwood	9	am this I carried all my Barley and in a very fine condition sent my men up to Risdon for Thatch

January 1808

Sund C.S. Kendal	10	am performd divine service and Church Lt. Lords friend where I dind at 4 p.m. and met Mr. Janson
Monday C.S. Doncaster	11	am at Court all the morning 2 p.m. the Lt. Govnr sent for me in the Eve went out a Pigeon shooting
Tuesday C.S. Payne	12	am at Court all the morning in the Eve I walkd to the Govmt Farm
Wed. C.S. Greenland	13	am at eight Mr & Mrs McCauley Mr and Mrs Powers and self went to Risdon where we dind and in the eve came and landed at the Govmt Farm drank Tea there and walkd home
Thursday C.S. Middleton finishd Harvest	14	am the morning very warm employd all the morning in getting in my wheat which I finishd at 4 p.m. and gave the Men spirits &c &c This day I cut a couumber.

January 1808

Friday C.S. Nevill	15	am at 11 I waited upon the Lt. Governor sent my men to Risdon for some straw employd in getting my onions ready for the House the day very hot
Saturday C.S. Stourbirdge	16	am at 10 my men came from Risdon with a boat load of straw the morning, very hot with a N. Wind at 11 so hot that it was im-possible to stir out the Country all on fire and all round the Town. at 20 minutes past 3 p.m. a strong Sea Breeze set in from the S.E.
Sunday C.S. Simmons	17	am Early this morning a Gun was fird from a ship in Sandy Bay, a boat was sent down with the Pilot H.M. Ship Porpoise arrived from Norfolk Island with 180 Settlers with thirty childn for this Colony at 10 she anchord in the bay at 11 performd divine Service. at 2 p.m. several of the officers of the Porpoise calld upon me

Monday C.S. The Queen	18	am at 8 the Colours were hoisted in Honor of the day at 12 the ordinance fird 21 Guns and at 1 p.m. H.M. Ship Porpoise did the same at 4 I dind on board H.M. Ship Porpoise
Tuesday C.S. Trent	19	am at home all the morning till 12 when the Lt. Govnr sent for me at 3 p.m. I dind with Lt Lord and met Lt. Simmons Mr. Janson Xtiand the little Girl
Wed. C.S. Pelham	20	am the Govnr sent for me and at 11 I attended punishment 1 p.m. I went on board H.M. Ship Porpoise and Lt Ellison came on shore with me
Thursday C.S. Ellison	21	am at 11 I went across the Water to shoot Pigeons and returnd 2 p.m. this day finish my new Barn 30 feet long 16 wide
Friday C.S. Panton	22	am employd all the Day in getting up Potatoes Mr Fosbrook calld upon me
Saturday C.S. Slone	23	am employd all the morn after my potatoes at 4 p.m. I dind with Mr Janson with Lt. Lord Lt Simmons in one Rood and a ½ I had 270 lb of Potatoes. we have a very great quantity. Lt Simmons of the R.N. gave me a very fine Cock Turkey and hen
		January 1808
Sunday C.S. Arrival	24	am at 11 performd Divine Service attended by the Lt Govnr and the Norfolk Settlers very early this morn one Great Gun was heard at a distance and the Lt Govnr sent the pilot down the River & Frederick Henry Bay in the Eve he returnd but could not see a ship
Monday C.S. Wellington	25	am at 11 engaged upon business finisd getting up the Potatoes at 3 p.m. a fire broke out at Sergt McCauleys House occasioned by the neglect of Mr & Mrs Hibbins Norfolk settlers, who were put into their house illegally at 5 p.m. Lieut Simmons Lieut Ellison Mr Slone Purser of H.M. Ship Porpoise and Mr Lutteridge the Surgeon of do with Lt Lord and Breedon, Mr Bowden Mr Collins and self dind with the Lt Governor
Tuesday C.S. Alford	26	am in the morn calld upon Mr Bowden and Mr Lutteridge came home with me
Wed. C.S. Grantham	27	am in the morn busey on board H.M. Ship Porpoise 5 p.m. Lt. Ellison and Mr Bowden Surgeon calld upon me took tea and stayd till pas 9

Thursday C.S. Blackmore	28	am this morning upon business respecting the Sarjt of Marines wifes things (Mrs Petty) and Maria Gardner at 4 p.m. I dind on board H. M. Ship Porpoise with Lt Lord Breedon and Mr Bowden
Friday C.S. Porpoise	29	am this morning early saild H.M. Ship Porpoise for Sydney
Sat. C.S. Clinton	30	At home all the day
Sund. C.S. Maitland	31	Performd Divine Service at 11 attended by all the settlers &c. I dind with the Lt Govnr
		February 1808
Monday C.S. Scott	1	at home all the day
Tuesday C.S. Wallace	2	am at 12 Mr Bowden calld upon me 3 p.m. I took my boat and went across the Water where I met my man who had been aKangarroing brought home 2 Men from the Lime Kiln, they were driven away by the Natives who had killd 2 of their Dogs
Wed. C.S. Bell	3	am this morn a general Muster of all the prisoners at 11 I waited upon the Lt Govnr with Lt Lord
Thursday C.S. Wakefield	4	am this aft went out afishing and caught some fine rock Codd
Friday C.S. Wakefield	5	am this morn Employd in collecting Garden seeds in the aft I went out afishing
Sat. C.S. Broomfield	6	am at home all the morn 4 p.m. I dind with Mr. Fosbrook Lt. Lord. Breedon. Bowden. and Mr Humphry
Sund C.S. Patterson Brumley	7	am at 11 performd Divine Service attended by all the Military and Civil &c during the time we were at Church a serjt and 7 men arrived here from Port Dalrymple they came after some men that had absconded from the settlement at 4 p.m. I dind with the Lt Govnr
Mond, C.S. Boone	8	am this morn fird my wheat stubble 2 p.m. I went across the River ashooting and my men afishing very bad success the aft very wet. Watts was confind a party of Men was sent off after the Port Dalrymple Bushrangers

Tuesday C.S.	9	am this morn I went across the Water and see Watt
Wed. C.S. Barrow	10	this day went out afishing the wr blowing hard calld upon the Lt Govnr
Thursday C.S. Lumley	11	at home all the day the wr Blowing hard
Fri/ C.S. Penryn	12	Early this morn went out afishing and came home at 11 went out again blowing very hard
		Feb. 1808
Sat.	13	am at 11 waited upon the Lt. Govnr at home the remainer of the day Mr Bowden and Mr Humphry took lunch with me
Sund. C.S. Parker	14	am at 11 performd Divine Service at home all the day blowing wr
Monday C.S. Springfield	15	am at home all the morn 3 p.m. I walkd to the Government Farm
Tuesday C.S. Smith	16	am this morn early I went out in my boat to Sandy bay, at 8 Sarjt Broomley and the party that went out after Lemon and Brown returnd without seeing them—
Wed. C.S. Thanet	17	am waited upon the Lt. Govnr the party of Port Dalrymple men went away I went out afishing in the Eve
Thursday C.S. Bell	18	am at home all the day in the Eve took a walk with my Gun no success
Friday C.S. Tunbridge	19	Upon business all the morning in the afternoon went out with my Gun to the Govmt farm
Sat C.S. Cavendish	20	am in the morning Early I went in my boat down the River and walkd home with my Gun. in the afternoon I go my cow and calf from the Farm given to me by the Lt Govnr—
		February 1808
Sunday C.S. Langford	21	am at 11 performd Divine Service. Lt Govnr Collins being unwell he did not attend. at home all the day

Monday C.S. Devonshire 22 am at home all the day busey in Breaking up my land

Tuesday C.S. Recovery 23 am this morn I took my boat and went out afishing it came on to blow that I was obliged to run the boat to Risdon and there leave her and walk home

Wed. C.S. Collins 24 am at home all the day blowing hard from the S. the Lt Govnr ill in bed all day—

Thursday C.S. Convalescent 25 am I calld at the Govnors. Afterwards went out with my Gun and killd some Pigeons my men went afishing busey threshing wheat

Friday C.S. Hobart 26 am at home all the morning and at 3 p.m. I took my boat and went out afishing

Sat. C.S. Arrival 27 at Day light this morn I got up and went down the River aHunting and Fishing returnd at 3 p.m. at 5 p.m. I buried Jeremiah Emblen formerly an Eminent Attorney in London

Feb 1808

Sunday C.S. Lord 28 the morning very hot at 11 performd Divine Service

Monday C.S. Minto 29 this morn upon business at Court. in the Eve I met with a dreadful accident fell from the steps of the door and cut my thigh by falling on the scraper

Tuesday C.S. Johnson 1 March 1808
Very ill in bed at 9 Brumley and 2 Privates arrived from Pt Dalrymple with Dispatches from Govnr Patterson. 10 Mr Humphry and Mr Bowden calld and gave me this infermation Pt Jackson New Governmen 26 Jan 1808—

Major Johnson	Govnr vice	—Blyth
Grimes	J. Advocate	—Atkins
Williamson	Commry	—Palmer
Bayley	Pro Marshall	—Gore
Jamison	Nav Off	—Cambell
Bayley	Sec	—Griffin
Lt. Lawson	Aid De Camp	—Portland Dead
Harris	Officer of Police	
Blaxcell 2 Blaxland	Magistrates	

at 11 Mich Manfield Duff and Jones came in with the Head of Lemon and brought Brown in prisoner the two Port Dalrymple Murderers. at 1 the Lt Govnr and Lt Lord calld upon me and shew the Letter and proclamation of Lt Govnr Johnson at Sydney

Wed. C.S. Stockport	2	Very ill in bed several of the officers calld upon me the Lady Nelson arrivd from Norfolk with Settlers
Thursday C.S. Kent	3	am this morn I was assisted in to my dining room but keept my bed. Lt Lord Fosbrook Harris calld upon me at 1 p.m. arrivd the Harrington Capt Cambel with Tea Sugar Spirits &c &c &c from India this Eve we had some rain
Friday C.S. Davison till further orders	4	am this day at 12 Lt Breedon of the R.M.F. went to Pt. Dalrymple and a party with Brown the murderer to be deliverd up to Govnr Patterson Lemon was killd by Mansfield a Settler G-Order-no Potatoes to be receivd into the Store
Sat. C.S.	5	am this morn Lt Kent calld upon me with Mr Bowden Mr Whitehead put in two Tonn of Potatoes this day
		March 1808
Sunday C.S. Carlisle	6	am confind to my bed all Day. Lt Lord, Fosbrook, Harris, Janson calld upon me
Monday	7	am at 8 The Lady Nelson fird a Gun as a signal for sailing I finisd all my letters and sent on board Mr & Mrs P. Ld Spencer Grimes &c &c
Tuesday	8	am this morning saild The Lady Nelson and Ship Harrington for Sydney—in the Eve some Rain
Wed.	9	am Very ill all day
Thursday	10	Do the day very wet
Friday	11	this day better though confind to my bed till 3 p.m. Mr Bowden dind with me the day very wet
Sat.	12	am at 12 Lt Lord Fosbrook and Mr Harris calld upon me
Sund	13	am at 12 the Lt Govnr came and stayd with me a long time several friends calld upon me
Mond	14	am Mr Harris calld upon me
Tuesday	15	at home still confind—the day very fine. Mr H's friend dind with Mrs MC.
Wed.	16	am Mrs. Sawyers [?] calld upon Mrs MC at 4 Lt. Lord dind with me Mr. & Mrs. McCauley went to the Govmt Farm to get their stock which the Govnr had sent there for their House being destroyd—

March 1808

Thursday	17	in the Morn Mr Bowden and Mr Hoply attended me, the Lt Govnr and Mrs Power came and sat with me some time
Friday	18	this day I was to walk about a little Mr. Harris calld upon me and in the Eve Mr Groves smokd a pipe with me
Sat	19	I finisd breaking up my land for wheat
Sund	20	we had some Thunder this afternoon but at a distance
Mond.	21	Lt Lord. Mr Fosbrook calld upon me
Tues.	22	Mr Harris calld and Mr. Hopley in the aft we had a severe Tempest of thunder and lightning
Wed.	23	The morn very fine with gentle rain
Thurs	24	this morning Mr Harris calld upon me with Mr. Bowden at 1 p.m. I waited upon the Lt Govnr the first of my walking up Town since my accident happend I took wine &c with him and in the aft he sent me some Mellon Mr Humphry calld upon me
Fri	25	this morning I calld upon Lt Lord and stayd with him some time
Sat.	26	at home all the Day Mr Bowden and Mr. Humphry calld in the morn Mr Harris and Hopley at about 12 p.m.

March 1808

Sund. Parole Knopwood C.S. Recovery	27	am after Breakfast I calld upon Mr Humphry with Mr Bowden and upon Mr. Janson the Lt Govnr came pas and when I came from Mr Jansons he askd me to walk home with him I stayd with him till near 3 p.m. when he gave the countersign the day very fine
Monday C.S. Bodmin	28	am at 11 I waited upon the Govnr at 3 p.m. the ship Rhodes Capt Brookes arrivd from England with a valuable cargo for Mr Cambel of Sydney, at 4 Mr Janson Harris Bowden Fosbrook Humphry dind with me and a very merry meeting we had
Tuesday C.S. Brooks	29	am at 12 Mr Bowden and Humphry calld upon me we took a walk and they dind with me the Lt Govnr and Mrs Power went on board the ship Rhodes
Wed. C.S. Douglas	30	am This morn waited upon the Lt Govnr and being so lame I went up to the Farm in my boat and dind with Mrs Powers, the Govnr walkd up and dind there in the Eve was obliged to come down in the boat

Thursday C.S. Cathcart	31	am this morn waited upon the Govnr
		April 1808
Friday C.S. Collingwood	1	am this morn I waited upon the Lt Govnr and at 4 I dind with him and met Capt. Brooks of the ship Rodes the mountain was covered with snow this morning
Sat. C.S. Popham	2	at 12 I went on board the Ship Rose with the Lt Govnr to take refreshment and returnd at 4 p.m. Mildred Rose dind here
Sunday C.S. Breedon	3	am The morn performd Divine Service the first after my illness and took refreshment at Govmt House afterwards I killd a White Hawk
Monday C.S. Spencer	4	am at 12 I waited upon the Lt. Govnr and afterwards went on Board the Rose Capt Brooks at 5 dind with Mr Humphry
Tuesday C.S. Wynn	5	at home all the day my men busey in marking out the land for Wheat
Wed. C.S. Farnham	6	am at home all the day
Thursday C.S. Arnold	7	am this Eve the Super cargo Mr Gorden of the Brig Perseverance came up
Friday C.S. Gordon	8	am this morn I walkd to the Government Farm and calld upon Mrs Power at Martha Hayes and dind with her came home in the eve and waited upon the Govnr, this morn arrived the Perseverance Capt Faulkner from India
Sat. C.S. Brooks	9	am this morn said the Rose Capt Brooks for Sydney. out afishing this day
		April 1808
Sund C.S. Perserverence	10	At 11 performd Divine Service and at 4 I dind with the Lt Govnr my poor Bitch Miss Died this aft
Monday C.S.	11	am This morn I began Sowing my wheat last year I began sowing my wheat on the 8 of May.

Tuesday C.S. Brackley	12	am busey in sowing wheat Rush alias Williams was taken by Schuller
Wed. C.S. Blackburn	13	am this morn Mr Humphrey and self calld upon Mr Bowden and at 2 p.m. Lt Lord calld upon me and I dind with him
Thursday C.S. Sunbury	14	am this day I finid putting in my wheat at home all the day
Friday Good Tunbridge	15	At 11 Performd Divine Service at 5 I dind with the Lt Govnr and met Mr Gorden super cargo of the Perseverance Capt. Faulkner Lt Lord and Collins at 10 p.m. Sargt Thorne wounded Bowden R.M.F.
Sat. C.S. Arrival	16	am This morn we heard that Hall and Lockley was drownd at 5 p.m. arrived the Estremina Mr Apsey commander
Sund C.S. Estremina	17	am performd Divine Service this Eve Hussy a Norfok settler hung himself
Monday C.S. Clermount	18	am Engaged upon the bench all the morn respecting Hall and John Lockley being drownd and Mitchell saved Mr Harris sat upon the Body of Hussy the Jury
Tuesday C.S. Denbeigh	19	in the morn I went down to Nagans Farm Hussey was buried by Sandy bay
Wed. C.S. Lord	20	am at 1 I went to Mr Lords and met Fosbrook at 5 Mr Humphry dind with me and Mr LittleJohn came
Thursday C.S. Scott	21	am this morn I went out afishing at 5 the Perseverance went into mid channel
Friday C.S. Sydney	22	am Early this morn said the Perseverance for Sydney and Lt Lord on board
Sat. C.S. England	23	Early in the morning Mr Humphry breakfasted with me and we went down the River afishing where we dind and came home at 8 in the Eve
Sund. C.S. Booth	24	Divine Service was not performd at 4 p.m. I dind with the Govnr

Monday C.S. Lynn	25	Engaged all the morn upon the Bench respecting Booth man in the aft calld upon Mr Fosbrook and took a pipe with Mr Groves
Tuesday C.S. Tame	26	Waited upon the Govnr and took Lunch afterwards calld upon Mr. Humphry in the Eve much lightning
Wed. C.S. Sandford	27	upon business all the morning with the Lt Govnr Mr Humphry and Harriet dind with me in the Eve much lightning
Thursday C.S. Oxford	28	At Court all the morning the day very cold and rain
Friday C.S.	29	Upon business all the morning much rain
Sat. C.S. New Norfolk	30	This morn Mr Humphry and self went over the water, when we came home he dind with me New Norfolk the Name of the Place where all the Norfolk Settlers resides
Sunday	1	May 1 1808 at 2 p.m. Mr. Humphry and self with 4 Men got into my large Boat and went up the River to Mr Faulkeners where we intended to sleep at his House but meeting with some of the Prisoners there made a fire and slept out by the River side
Monday	2	soon after Breakfast we got into the boat and proceeded up the River. I killd 2 Ducks and sent the men out aKangarroing, they had no success made a fire got our Dinner and slept there it was a dreadful cold night
		May 1808
Tuesday	3	at Daylight we sent out 2 of our men aKangarroing and they were to meet us at the first River. I killd a Duck and they brought 1 Kangarro. Breakfasted there and at 12 Proceeded up the River to the first fall got there about 4 took refreshment and came down to Dennis McCartys where we Dind sent the men to fish for Eeels, they caught some and we had them for supper, sleept there and had a very wet night, the House was not coverd in—
Wednesday	4	am at 12 we made sail and came down the River the wind fair till we came to long reach when it blew a Gale of wind against us. it was with great difficulty that we could keep the Boat off shore, the Sea ran very high at 7 oclock as we came by Hunters Island we heard 4 Guns fird from a ship in the River. and the Lt Govnr sent a boat down the river, when I got home Mr LittleJohn was at my house

Thursday C.S. Chase	5	after Breakfast I waited upon the Lt Govnr who informd me that the Captains Name was Chase and the ship Du Buck last from Timor. she has 300 Ton of Sperm oile, one year from England at 1 p.m. Mr. Humphry and Mr Bowden calld upon me and took refreshment
Friday C.S. Timor	6	am this Morn sowd Pees and Beans &c took a walk & the mountain covrd with snow
Sat. C.S. York	7	Waited upon the Lt Govnr
Sunday C.S. Ray	8	am the morning fine at home all the day
Monday C.S. St. Ives	9	This morning Mr. Humphry and self went across the the Water I killd my white Calf.
Tuesd. C.S. Ripley	10	At 9 I calld upon Mr Bowden and we walkd to his Farm returnd about 4 and I dind with the Lt Govnr
Wed. C.S. Talbot	11	At 10 I went upon the Parade afterwards calld upon Mr Bowden

May 1808

Thursday C.S. Dorchester	12	am this day we had a great quantity of Rain. This morn the Du Bucke saild to Frederic Henry Bay
Friday C.S. Burton	13	am busey in Planting Cabbages &c at 4 Maria Risby dind with Mr. & Mrs. McC, the wind blowing very fresh Mr Bowden calld upon me
Sat. C.S. Bath	14	The day fine at 12 waited upon the Govnr and in the aft went out ashooting
Sunday C.S. Pelham	15	I calld upon Mr Humphry this morn and Married Elizabeth Smith the day fine but cold
Monday C.S. Bowden	16	am calld upon Mr Humphry and at 2 p.m. Mr. Bowden calld upon me smoaked a pipe at Mr Humphrys
Tuesday C.S. Tounely	17	At home all the morn at 5 p.m. I dind at Mr Janson's

Wed. **Constitution Hill** **Breakneck Hill**	18	At 12 Mr Humphry and self went across the River and walkd to the Coal River 12 Miles into the country. we got there about 6 made fire in the oven a place very large which will contain 100 men the Enterence is small but it rises gradually and at the side is a hole where the smoake goes out. the night was very wet but we felt no inconvenience from it
Thursday	19	The morning very wet went to the Coal River and got Coals my man went out aKangarroing but no success he killd a Duck and I some birds
Friday	20	At 10 we prepard to come home the day very wet arrived Breakneck Hill about 1 p.m. where we stoppd and made a fire dressd some Pork and at 5 p.m. we arrivd home
Sat. **C.S.** **Dee**	21	the Day very wet at 2 p.m. I waited upon the Govnr Mr Humphry and self calld at Lt Breedons &c
Sund. **C.S.** **Thornton**	22	am the morning wet at 4 p.m. I dind with His Honor the Lt Govnr—
Monday **C.S.** **Clermont**	23	upon business all the morning at Court afterwards waited upon the Lt Govnr
Tuesday **C.S.** **Linton**	24	upon business all the Morning at Court the Weather very cold and stormy—and the night very bad—
Wed. **C.S.** **Thornhill**	25	the day very stormy in the Eve I smokd a pipe at Mr Humphrys Mr & Mrs Bliss dind with Mrs. McCauley
Thursday **C.S.** **Warren**	26	am this morn I walkd to the Govmt Farm upon business and returnd at 4 p.m. Mr LittleJohn was at my house
Friday **C.S.** **Duckworth**	27	Upon business at Court all the morning Mr Humphry calld upon me
Sat. **C.S.** **Arrival**	28	this morn Mr Humphry and Mr Bowden call upon me at 12 infermation that a Brig was coming up the River we had information that it was the Eagle Brig from India belonging to the House of Cambel and Hook super cargo. Capt Webster
Sund **C.S.** **Eagle**	29	in the morning performd Divine Service at 4 p.m. I went to the Govnrs to dinner and was introduced to Mr Hook the super cargo and owner of the Ship Eagle this morning Early Sargt McCauley went out Early after the Bush-rangers

May 1808

Monday C.S. Hook	30	at home all the morning Mr Humphry calld upon me and we went to Mr Bowdens
Tuesday C.S. Gilmore	31	This morn I took a walk with my Gun at 4 p.m. dind with His Honor the Lt Govnr and met Mr. Hook the Super-cargo of the Eagle and Capt Webster
Wed. C.S. Cary	1	June 1808 I walkd to the Farm and home at 5 p.m. to dinner killd some Wattle Birds, the wr very fine
Thursday C.S. Madrass	2	am the morning very fine this day I gave my men some Meat and Spirits it being my Birth day
Friday C.S. Pellew	3	I went on the East Side of the River and returnd home to dinner
Sat. C.S. The King	4	am at 12 I waited upon the Lt Govnr and a Royal Salute was fird from the Ordinance at 5 p.m. he had all the Officers to dinner with him Mr Hook and Capt Webster of the Eagle Mr. Janson Bowden Humphry Fosbrook Lt Breedon Mr Collins and self
Sunday C.S. Estremina	5	at 11 performd Divine Service H.M. Schooner Estremina arrivd from Norfolk Island with Settlers
Monday	6	am at home all the day
Tuesday	7	At 10 Mr Humphry and self went down the River to the N.W. arm in Storm Bay Passage at 3 we landed and made a fire where we slept
Wed.	8	Early this morn we sent out 2 Men to kill Ducks and my two men came to me and brought a Kangarro of 90 weight we slept there all night Mr Harris and Mr. Hopley arrived from Port Dalrymple
Thursday C.S. Dorset	9	am early this morn one Man went a duck hunting and 2 aKangarroing they brought home one of 80 weight. we breakfasted and at 12 got into the Boat as we came out of the passage we see 2 Vessells going up to Hobart Town. at 5 we landed at Nagans Farm where we dind, and at 6 got into the boat arrived at Hobart Town ¾ past 7 arrivd the Eliza and Govnr Hunter Schooners from Sydney
Friday C.S. Eliza	10	Upon the bench all the Morn. Lt Breedon Mr Humphry and E. P. Harris came into Court at 4 p.m. I dind with his Honor the Lt Govnr, and met Capt Webster of the Ship Eagle the night very bad with Snow

Sat. C.S. Courtney	11	am Mr Bowden and Mr Humphry calld upon me I waited upon the Govnr at 12 the day very cold and the mountain covrd with snow
Sund. C.S. Ward	12	am at 11 performd Divine Service, this morn we heard the report of a Gun down the River, at 2 p.m. we had infermation that Capt Chase of the De Bucke fird a Gun to a ship which he saw at anchor off Capt Piller. Vessell laying in Sullivan Cove Hobart Town the Eagle Brig from Canton. the Colonial Vessel Estremina with Settlers from Norfolk Island. the Govn Hunter schooner and Eliza with Corn from Sydney
		June 1808
Monday C.S. Dundee	13	am in the morning I waited upon the Lt. Govnr who informed me that there was a ship in Storm bay at anchor all hands bad the Dundee from Pulopenang Capt Cumming at 9 saild H.M. Schooner Estremina for Sydney
Tuesday C.S. Eagle	14	am engaged upon the Bench all the morning calld upon Mr Fosbrook
Wed. C.S. Mason	15	am this day I went out with my Gun and killd some fine Wattle Birds
Thursday C.S. Webster	16	at 12 saild the Brig Eagle for Sydney the wind blowing very fresh at N.W. in the Eve I smokd a pipe with Mr Humphry
Friday C.S. Longford	17	Engaged all the morning upon the bench afterwards Mr Humphry and self walkd to Sandy bay to see the ship Dundee coming up
Sat. C.S. Cumming	18	am The morning very cold and a great quantity of rain and snow, there was more snow upon the Mountain than ever I see before. Capt Cumming landed from the Dundee and waited upon the Lt. Govnr—the wind blowing hard from the S.W.
Sunday C.S.	19	am the morning very cold Divine Service could not be performd at 4 p.m. I dind with the Lt Govnr
Monday C.S. Carlisle	20	at 11 upon the bench all the morning and in the Eve smokd a pipe at Mr Bowdens met Mr Janson Mr Humphry and Capt Cummings
Tuesday C.S. Rose Castle	21	At 9 Breakfasted with Mr Bowden and walkd to his Farm

June 1808

Wed. C.S. Mollet	22	This morn went across the Water with my men Mr Bowden Mr. Fosbrook Mr Humphry and Capt Cumming calld upon me
Thursday C.S. Randall	23	this morn calld upon Mr Humphry and Capt Cumming came at 2 we went on board and Dind met Mr Bowden came on shore in the Eve very cold—
Friday C.S. Graves	24	am at home all the morning at 4 I dind with Mr Humphry and met Capt Cumming
Sat. C.S. Curtis	25	At home all the day
Sund. C.S. Brompton	26	At 11 performd Divine Service
Monday C.S. Maltby	27	At 10 I walkd to the Government Farm upon business at 4 dind with Mr Bowden and met Mr. Janson. Fosbrook Humphry and Capt Cumming
Tuesday C.S. Norton	28	am I waited upon the Lt. Govnr and dind with Mr Humphry at 4 p.m. the day very fine
Wed. C.S. Acton	29	am at 10 the De Buke came and anchord in the bay— at home all the day
Thursday C.S. Scott	30	am a very sharp Frost this morning at 4 p.m. Capt Cumming of the Ship Dundee Mr. Janson Bowden Fosbrook Humphry dind with me

July 1808

C.S. Danbury Friday	1	at home all the day
Sat. C.S. Graham	2	The Duboc saild a whaling after delivering her Spirits into the Store at 2 Mr. Humphry and self went on board the Dundee Saild the Eliza sloop for Sydney
Sund. C.S. Rixton	3	the morning very wet and cold Divine Service could not be performd
Mond. C.S. Bennet	4	am upon business all the morn in the Eve Lightning it was a general observation that in the Winter Season scarce a night passes but we have Lightning

Tuesday C.S. Dumfries	5	am at home all the day In the Eve Lightning from the N.W.
Wed. C.S. Dashwood	6	At 10 the Dundee made the Signal for sailing at 12 Capt Cumming Mr Bowden Mr Humphry calld upon me about 7 p.m. saild the Dundee Capt Cumming for Sydney the Eve very fine. Joseph Powell died. In the Eve Lightning from the N.W.
Thursday C.S. Chandos	7	am at home all the morning. Mr Humphry calld upon me
Friday C.S. Colchester	8	am upon the bench all the morning
Sat. C.S. Payne	9	This morn I took my boat and landed at Sandy Bay walkd home in the Eve I receivd Bechew a Melay man that deserted from the Dundee Capt Cumming ship
Sund. C.S. Powis	10	The morning very cold at home all the day
		July 1808
Mond C.S. Calder	11	At 11 waited upon the Lt. Govnr upon business and took a walk at 1 I took a lunch with him Mr Humphry dind with me and Mr Groves took a pipe in the Eve
Tuesday C.S.	12	at home all the day
Wed. C.S. Cooke	13	Early this morn I took my boat and went over to Ralphs Plain where I had 400 acres of Glebe land markd out by Mr Shipman and in the Eve I returnd home
Thurs. C.S.	14	at home all the day I got 40 Gallons of Spirits from the Store
Friday C.S. Pellican	15	in the morn I waited upon the Lt Govnr calld on Lt Breedon &c &c
Sat. C.S. Alton	16	at home all the day
Sund/ C.S. Lawson	17	am the day being very cold Divine Service could not be performd

Constables—Forbid releasing persons taken in charge until discharged by a Magistrate May 14. 1802

Convict Servants—not to be beaten by their Masters who are to complain to a Magistrate when necessary on pain of forfeiting such future accommodation. Mar 8 1803

Licensed Persons—bound by recognizance to the due assize of Weight and Measure to permit no Gaming Drunkeness indecency or Disorder, to pay due respect to existing regulations, not to entertain persons from Tap-too beating to the following noon, nor during Devine Service. Penalty forft of license and recognizance, the latter to informer and 5£ to orphans. B.M. Oct. 26 1805

Things from Mr Bevan 1806

	£	s	d
Pr Estremina McCauley			
12 pairs of Cotton Stockings	6		
2 lb Pepper			
6 pair of Black Silk Stockings			

Kangarro killd by my dogs since August 24 1804 and Emews
Kan. 42 Emews 4

Kangarro 1805

1805				
Jan.	10	Kangarro		1
	15	„		1
	19	„		1
	21	„		1
	26	„		4
	30	„	9	1
Feb.	15	„		1
	17	„		1
	22	„	3	1
Mar.	1	„		3
	11	„		2
	23	„		2
	28	„	small	2
	31	„	10	1
Apl.	1	„		1
	3	„		1
	8	„		1
	9	„		1
	11	„		2
	16	„		3
	20	„		2
	23	„		1
	24	„		3
	27	„	16	1

May				
	1	Kangarro		1
	2	„		3
	13	„		1
	16	„		1
	18	„		1
	26	„	10	3
June	2	Do „ very large		3
	7	do		1
	14	„		1
	19	„		3
	24	„ „		3
	27	„		1
	30	„		1
July	6	„		4
	11	„		2
	15	„		3
	21	„		4
	31	One I shot		13

Aug.	2	Kangarro	2
	7	„	7
	10	„	7
	16	„ 2 very large	8
	24	„	8

I have had Spot one year the day August 24 and he had killd 141 Kang—24 Emews

Aug	29	Kangarro 15.	1
Sept.	9		11
	13		1
	15		8
	23		9
	27		5
Oct		Shot one	
	do	do	2
	18	„	1
	24	„	2
	27	„	3
	31	„	4

Nov.	5	Kang.	4
	8	„	5
	10	„	1
	15	„	6

		January 1805		Emews 1805
	3	Emew		1
Feb.	25	do		1
Mar.	1	„		1
	5	„		1
Apl.	25	„		1
	27	„		2
May	17	„		1
June	14	„		1
	19	„ very large		2
	24	„ „ „		2
July	30	„		1
	15	„		1
Aug.	2	„		2
	10	„		2
	16	„		1
	29	„		1
Oct.	31	„		1
Nov.	21	Kang		4
	30	do		3
		do	23	

Head and Pluck	8d
Forequarters	8 lb.
Skin	2/- a piece

14th April 1807

the Sum of Sixty Nine pounds 15 shillings and six pence
being the payment of 927 pounds of kangarro
Marshals Court
Mareshall Saxon, from mare a horse and
schall Governer

So true it is that in all countries poverty is considered rather a crime than a misfortune, and that he who has nothing to bestow, is immediately supected of an intention to take away

Ewe 4 May 1805 S Gunn Lt 9 May 1805
Blackcat 23rd May 1805 No Spirits 6 May 1805

March 5th £3 to Mrs MC.

Horatio Nelson
Honor est a Nils

Rev. R. K. return of Land Stock &c 14 Aug 1807

Wheat	acres		
5	Potatoes	Garden 1	Total 30
	½		

Cows	Bull Calves	Cow Cal	Goats Ram	Feamale	Servts
2	2	1	1	6	4

Miss Mabel Hookey has supplied the following information:—

'Some of the Knopwood diaries were purchased at the sale of the Rev. Robert Knopwood's effects by my grandfather George Stokell, and were for many years stowed away in a cupboard at his home " Rokeby House ", at Rokeby. The volumes so purchased comprised those covering the years 1801-1804; 1814-1820; 1822-1834; and 1836-1838. Those covering the years 1808-1813; 1821; and 1835, were not included in the purchase and their fate is unknown.

George Stokell's volumes were inherited by his daughter Henrietta Stokell, who gave volume I (1801-1804) to her brother George Stokell. This volume passed to his daughter Alice Stokell, who sold it to the Mitchell Library.

The remaining volumes were given by Henrietta Stokell to me. I kept volume II (1805-1808), which is still in my possession. The other three volumes were sold by me to Angus & Robertson, who resold them to the Mitchell Library'.

The Geology of the Country Around Tarraleah, Tasmania

By

REX T. PRIDER

(Department of Geology, University of Western Australia)

PLATES VII, VIII

Abstract. The regional geology of an area of 260 square miles in the vicinity of Tarraleah on the central plateau of Tasmania is described. The most extensive formation is the Jurassic dolerite. Smaller inliers of Permian marine and Triassic freshwater sediments are of sporadic occurrence. A reclassification of the Permian into the Marlborough Series at the base, Woodbridge Formation and Ferntree Formation at the top is suggested. Extensive areas are covered by Tertiary basalts and smaller areas by Pleistocene glacial till. The structure in the pre-Tertiary rocks shows a gentle regional dip to the east which is interrupted by several strike faults with large downthrows to the west.

I. INTRODUCTION

This paper is the result of a geological reconnaissance of the country in the vicinity of Tarraleah (42° 18′ S.Lat., 146° 26′ E.Long.) made in January-February, 1947, on behalf of the Hydro-Electric Commission of Tasmania and is published through the courtesy of the Commission.

The area examined, which is shown on the accompanying geological map, is somewhat irregular in shape, covering an area of approximately 260 square miles. It is the stretch of country north and east of the River Derwent, extending from Derwent Bridge on the west to the hamlet of Dee on the east, with an extension to the north along the valley of the River Nive as far north as its confluence with the Pine River. The village of Tarraleah is situated to the south-east of the centre of the mapped area.

The mapping was effected by stereoscopic interpretation of aerial photographs, supported by traverses on the ground. All of the roads, tracks, transmission lines, and main streams in the area have been traversed, in addition to

numerous other cross country traverses, so that, with the exception of areas specifically indicated on the map as untraversed, the geologic boundaries can be regarded as of fairly high reliability.

The western margin of this area receives an average annual rainfall of 60 inches, which falls off rapidly to 35 inches per annum along the eastern margin. The entire area, except for scattered marshes, is thickly covered by Eucalypt forest with very dense undergrowth, which, however, becomes less dense in the lower rainfall areas to the east. The dense vegetation makes traversing on foot very slow and obscures the geology, both on the ground and in the air photos. With the exception of some of the basalt-covered plains in the vicinity of Bronte which have been cleared for sheep grazing purposes, the area is almost entirely in its virgin state.

II. Physiography

The area examined is part of the high dolerite plateau of Tasmania standing at an average elevation of approximately 2500 feet above sea-level, above which rise some isolated hills such as Brady's Sugarloaf (3361 feet) and the Wentworth Hills scarp. The plateau is a somewhat undulating surface with broad N.W.-S.E. trending depressions, and on its surface are many high-level marshes. Small marshes occur throughout the area, but more extensive marshes (Brady's Marsh, Big Marsh, Father of Marshes) are developed at an approximate elevation of 2150 feet to 2200 feet in the belt of country extending south from Bronte. All of these marshes are somewhat elongated in shape in a general N.W.-S.E. direction and their development, as will be shown later, has been controlled largely by the geologic structure.

The plateau is deeply incised by the Rivers Derwent, Nive, and Dee, and their tributaries. All the main rivers drain in a general southerly direction and in this area, for the most part, pursue parallel courses.

The *Derwent*, rising in Lake St. Clair to the north of Derwent Bridge, flows almost due south through a wide U-shaped (glacial) valley for 10 miles south of Derwent Bridge to Butler's Gorge, where it changes its course abruptly to flow through a rather mature valley for approximately two miles in an E.N.E. direction before again resuming its more or less normal south-easterly trend through a very immature valley in the dolerite. There are no important tributaries to the Derwent in this area, except the Nive, which joins it near the southern margin of the map—it appears here that the Nive is actually the master stream and the Derwent is its tributary.

The *Nive*, with the exception of minor bends, pursues a north-south course throughout the mapped area. North of its junction with the Pine River the Nive flows in a south-easterly direction in an immature valley deeply incised in the dolerite plateau. At approximately one mile south of its confluence with the Pine the Nive valley becomes much wider and more mature, the river flowing through a flood plain approximately half a mile wide for a distance of one mile, where it is joined by the Serpentine Creek entering on the east bank. South of this it flows through a narrow gorge in the dolerite, and downstream from this gorge it enters the basalt area where the nature of the valley again changes markedly. It is here incised only 250 feet in the basalt-covered plains and is characterised by broad sweeping curves, meandering at will and not controlled in any way by the geological structure—the bed has a braided character with many boulder accumulations, and it receives tributaries from both east and west. This is its nature where it crosses the Lyell Highway (Plate VIII, fig. A). At a short distance downstream from the Lyell Highway the Nive leaves the basalt area and again suffers a marked change in character—the valley becomes narrower

and the river is incised approximately 1000 feet. This immature nature persists as far south as its crossing with the Tarraleah-Ouse Highway, where it enters an area of Triassic shales and its valley becomes more mature. Other than the Pine and Derwent, which have already been mentioned, the main tributary of the Nive in this area is the Clarence River entering from the west at approximately eight miles north from the Tarraleah power house; other west bank tributaries being Wentworth Creek, Horne's Creek, and Wilson's Creek. All of these west bank tributaries have very steep grades where they enter the Nive and in the lower parts of their courses are characterised by many waterfalls. On previously published maps (e.g., the 4-mile State map No. 3 of Tasmania, 1944), Wentworth Creek is shown as entering the Nive at two miles north of Horne's Creek. Actually, the Wentworth flows into Horne's Creek and the single stream enters the Nive at three and a quarter miles upstream from the Tarraleah power house.

The *River Dee* is the third main drainage channel. It also flows in a general southerly direction. In the area shown in this map (Plate VII) it has similar characteristics to the Nive between the Pine River and Bronte Gorge, i.e., after entering the mapped area in an immature valley it flows through a wide flat area for several miles to where it crosses the Lyell Highway. Downstream from this point its valley again becomes immature like that of the Nive near Tarraleah, although it is not so deeply incised as the Nive.

III. Geology

1. General Outline.

By far the most extensive formation developed in this area is the Jurassic dolerite. Smaller inliers of Permian and Triassic sediments are of sporadic occurrence. Extensive areas are covered by Tertiary basalts and in places there is a thin veneer of Pleistocene glacial deposits. The general geological structure of the pre-Tertiary rocks shows a gentle regional dip to the east, which is interrupted by several strike faults with large downthrows to the west. Owing to the extensive areas of dolerite in which the geologic structure is indeterminable it is difficult to obtain a complete picture of the regional structure and it is very difficult to correlate the various isolated occurrences of Triassic sediments throughout the area. The regional easterly dip was responsible for the pre-basalt topography which has been to some extent drowned by the extensive outpourings of basalt which are now dissected by the River Nive. Except in the westernmost part of the area in the valley of the River Derwent the Pleistocene glaciation appears to have left very little trace of its activity.

2. Stratigraphy.

A. *Permian Sediments.*—Rocks of Permian age occur in one part of the area only—in the section (which for convenience may be called the Marlborough inlier) extending from London Marsh Farm in a north-westerly direction to the Marlborough Highway, which runs from Bronte to Great Lake. The best outcrops of these rocks are to be seen along the valley walls of Serpentine Creek in the vicinity of 814N., 447E.* The only previous examination of this Permian section was made by Strzelecki, who collected a number of fossils from this locality which were described by Lonsdale and these descriptions have been referred to in the literature

* Co-ordinates are units of 1000 yards and refer to the grid on the accompanying geological map (Plate VII), which is the same as the military grid on the 4-mile State map of Tasmania, published in 1944. Co-ordinate references given elsewhere in this paper refer to the grid on the accompanying geological map.

since. Strzelecki's account of these rocks, published in his 'Physical Description of New South Wales and Van Dieman's Land' (1845) is so brief that it may be repeated here in full—

'8th. *The sources of the river Nive, in the Upper Country, and the locality east of Marlborough,* exhibit perhaps the most complete section of this group that is to be seen. Here a massy fossiliferous limestone abuts against a very inclined argillaceous and siliceous slate: upon this limestone rests a slaty fragmentary rock without fossils; a fossiliferous, arenaceous, and argillaceous massive rock, with somewhat of a slaty fracture, follows. This is crowned by a sedimentary deposit of mud and fine sand, which reaches an elevation of 5200 feet. The series in this locality contains the following fossils:—

Crinoidal columns
Productus brachythoerus
Spirifer subradiatus and *S. Stokesii*
Fenestella internata and *F. ampla.*'.

Johnson (1888, p. 128) only gives a brief reference to Marlborough, which he quotes directly from Strzelecki's earlier description and it is apparent that Johnson himself did not visit the area.

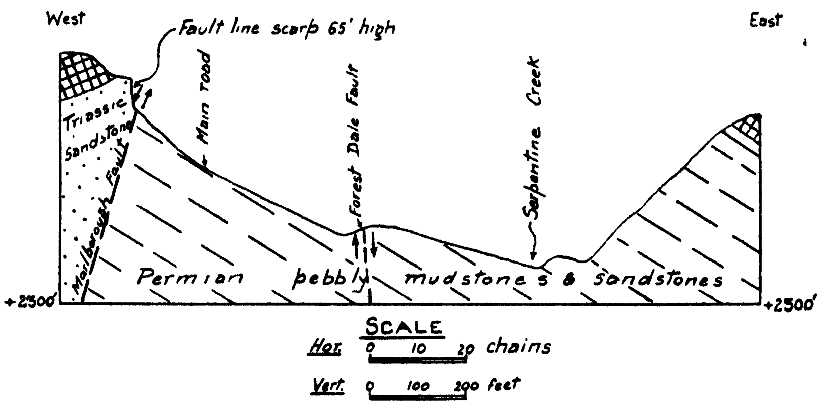

FIG. 1.—Diagrammatic east-west section at co-ordinate line 818 N. across the Marlborough and Forest Dale faults showing the fault line scarp along the Marlborough fault. The cross-hatched areas at the east and west ends of the section are of dolerite.

In this area the Permian rocks form a belt from one to one and one-half miles wide trending in a north-south direction (fig. 2). To the west this Permian inlier is truncated abruptly by the Marlborough Fault, which has thrown down Triassic rocks and associated dolerite sills to the west, and we find here Triassic sandstones in contact with the lower members of the Permian sequence. The contact crosses the main road at 814N., 446·3E., and here the Permian is in juxtaposition to the dolerite. Further north (due west of Forest Dale Farm) the contact is between Triassic quartz sandstones and Permian pebbly mudstones (fig. 1). It is interesting to note here that, although the west is the downthrown side of the fault, the scarp along the fault line is facing east, due to the Triassic sandstones being more resistant to erosion than the Permian pebbly mudstones and sandstones, and this occurrence indicates that topography is not an infallible indicator of faulting in this region.

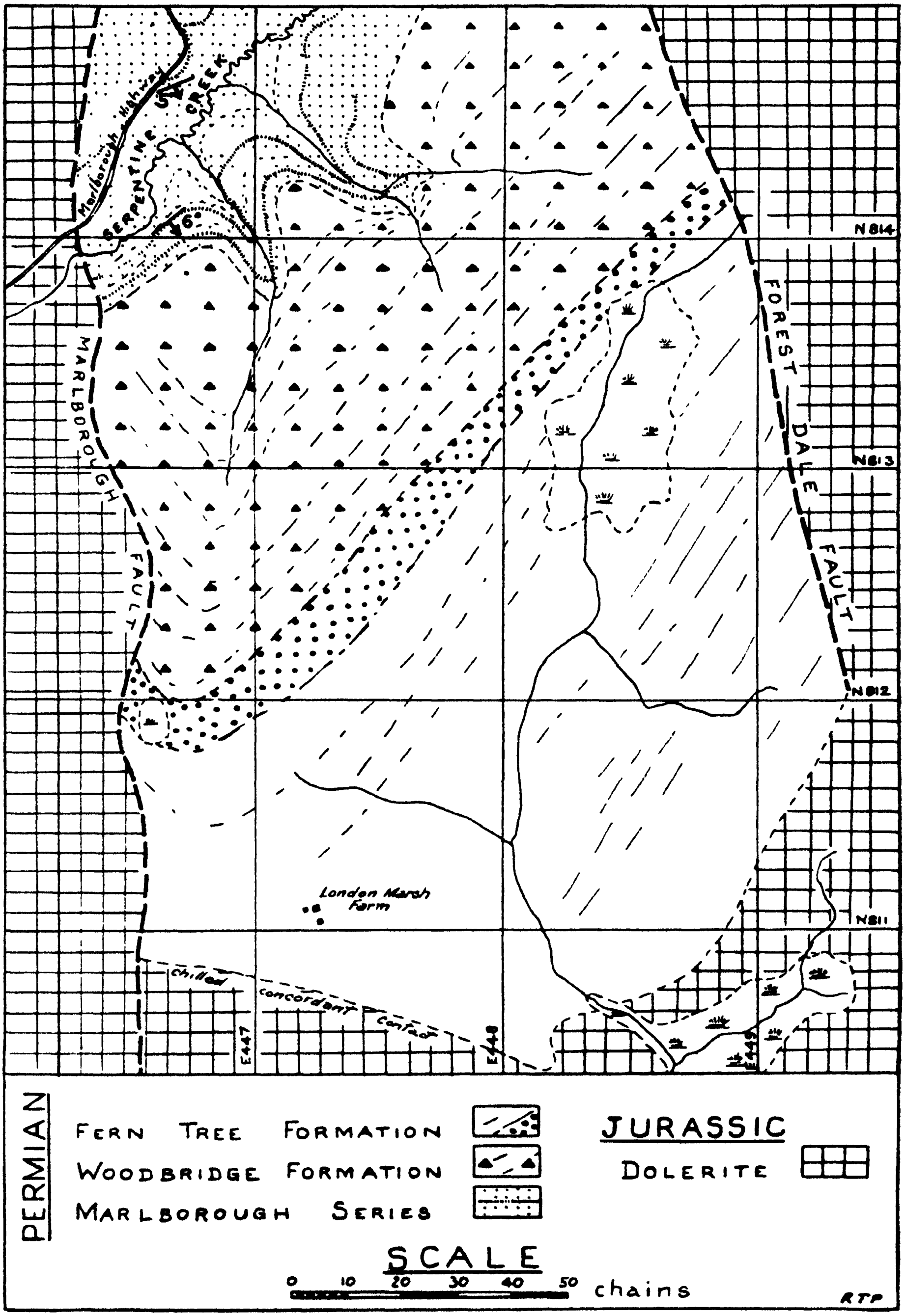

FIG. 2.—Geological map of the Marlborough Permian inlier showing subdivision of the Permian. The dotted section at the base of the Fern Tree Formation is a sandstone which may be the Risdon Sandstone of the Hobart District. Within the Marlborough Series exposed in Serpentine Creek the dotted areas are the Bronte Sandstone Facies and the hatchured bands are the Granton-Grange calcareous mudstone Facies. Grid lines refer to the grid on the Geological Map (Plate VII).

The eastern margin of the Permian belt is in part a concordant intrusive contact with dolerite and in part a faulted contact. To the east of Forest Dale Farm the Permian dips flatly to the east under the dolerite forming the higher country, the contact being here a concordant intrusive one. Again to the south and east of London Marsh Farm the Permian mudstones dip conformably under the dolerite, but there is considerable doubt as to whether this horizon of the Permian is the same as that of the contact east of Forest Dale Farm. Elsewhere the eastern contact of the Permian with the dolerite is a discordant one—on the air photos the bedding of the Permian sediments can be seen to be sharply truncated by the dolerite to the east. This contact is considered to be a fault (the Forest Dale Fault) which was either slightly older than or contemporaneous with the Jurassic dolerite intrusions, along which the dolerite has arisen in the form of a dyke (fault intrusion) and spread out at different stratigraphic horizons in the Permian to the east and west.

The strike of the Permian sediments in the part of the Permian belt lying between the Marlborough and Forest Dale Faults is north-east with a uniform gentle south-easterly dip of 5°, while in the section to the east of the Forest Dale Fault the general strike is north to N.N.W. with an easterly dip of 5° to 10°. There is no apparent distortion of the Permian beds at the Marlborough Fault.

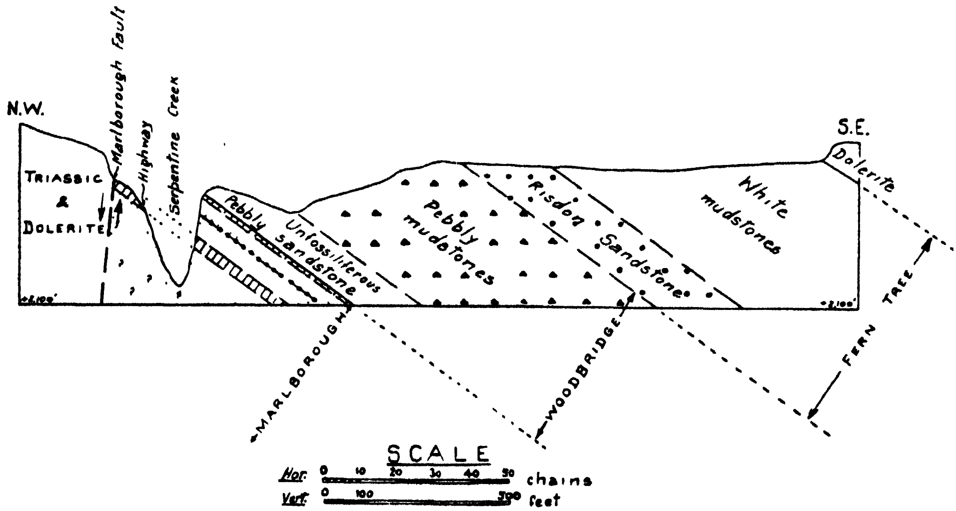

FIG. 3.—Geological cross-section of the Marlborough Permian inlier showing proposed subdivision into the Marlborough Series, Woodbridge Formation, and Fern Tree Formation (with the basal sandstone member which is probably the Risdon Sandstone of the Hobart District). Within the Marlborough the dotted sections are the Bronte Sandstone Facies, and the hatchured strata are the Granton-Grange Mudstone Facies. There is a well-defined stratum, 10 feet thick, of richly fossiliferous conglomerate between the two prominent mudstones and is indicated on the section by small circles.

Permian Lithology.—The Permian sediments grade from calcareous mudstones through pebbly mudstones to sandstones and pebbly sandstones. The most complete section available is that running in a south-easterly direction from a point on the Marlborough Highway at four and a half miles north from Bronte. The Permian section exposed here is estimated to have a stratigraphical thickness of 1250 feet (fig. 3) and it can be conveniently subdivided into three main formations,

which can be correlated with the Permian rocks of the Hobart District described by Lewis (1946) and Voisey (1938), as follows:—

1. *The Marlborough Series.*—The lowest part of the section consists of interbedded white fossiliferous conglomeratic sandstones, yellow fossiliferous mudstones (lithologically similar to Lewis' Grange Stage of the Hobart District), and dense bluish-grey fossiliferous calcareous mudstones (lithologically similar to Lewis' Granton Stage of the Hobart District). The base of the Permian rocks is not exposed in this area. The name *Marlborough Series* is here proposed for this fossiliferous section of the Permian, in which there are three distinct facies thus:—

(*a*) *Bronte Facies.*—A pebbly fluvio-glacial sandstone facies which is richly fossiliferous in places. The fauna is dominated by large Spirifers, including *S. avicula*, *S. vespertilio*, and *Martiniopsis* sp. Other fossils present are *Conularia*, *Platyschisma*, *Aviculopecten*, *Eurydesma* (rare), various *Fenestellidae*, *Stenopora*, and crinoid stems. The typical rock of this facies is a creamy white pebbly fossiliferous sandstone. It carries angular boulders up to six inches diameter of various rock types of which quartzite is the most abundant, set in a sandy matrix. This sandy matrix (from a microscopic examination) is composed of poorly graded detrital material ranging from clay to coarse sand, the sand grains being angular and consisting predominantly of quartz with minor amounts of clear fresh felspar (both microcline and plagioclase) and muscovite. There can be little doubt that the poorly graded material forming the rocks of this facies is of glacial origin. A variant of these pebbly sandstones (from a small roadside quarry five miles north from Bronte along the Marlborough Highway) is a cream coloured silty mudstone containing abundant crinoid stems along with *Fenestellidae*, *Stenopora*, and *Mytilus*—this rock contains a considerable proportion of fine silt in which quartz, fresh felspar, and muscovite were identified.

The Bronte facies forms the greater part of the Marlborough Series exposed by Serpentine Creek. It does not appear to be developed in the Hobart District.

(*b*) *Grange Facies.*—A richly fossiliferous yellow mudstone facies in which the fauna is dominated by *Fenestellidae* and *Stenopora (Batstomella)* with abundant *Strophalosia*, *Spirifer*, and *Aviculopecten*, and also *Productus* and *Mytilus*. The yellow mudstones of this facies are practically free of calcareous material and the fossils are casts only. Lithologically these rocks are identical with Lewis' Grange Stage mudstones of the Hobart District.

(*c*) *Granton Facies.*—A richly fossiliferous bluish-grey calcareous mudstone facies with the same fauna as the Grange facies. The rock is essentially a mudstone, the only calcareous material being present in the actual shell remains, and it differs from the Grange facies only in colour and the presence of the actual shell remains rather than casts. It is lithologically similar to Lewis' Granton Limestone Stage of the Hobart District.

2. *The Woodbridge Formation.*—This consists of unfossiliferous pebbly mudstones with occasional erratics up to several feet in diameter. This formation conformably overlies the Marlborough Series (fig. 2) and extends in a southerly and south-easterly direction from the crestline of the southern side of Serpentine Creek. Throughout this area the bedding can be distinctly seen on the air-photos in the lines of vegetation which grows mostly along the lines of the almost imperceptible escarpments and not on the dip slopes. For the most part the

lithology of this section of the Permian is white pebbly mudstones with thin interbedded pebbly sandstones and it may be correlated with Voisey's Woodbridge Stage of the Hobart District (Voisey, 1938, p. 314).* In places grey to white mudstone fragments in a clayey soil predominate, elsewhere accumulations of pebbles and boulders weathered out of the mudstones are the only materials exposed—these boulders are up to 20 inches in diameter and include a variety of rock types such as granite, porphyry, phyllite, quartz, quartzite, West Coast Range conglomerate, chlorite schist, &c. No fossils were found here. This stage is undoubtedly of glacial origin.

The Woodbridge Formation developed in the Marlborough Permian inlier has a stratigraphical thickness of 360 feet and is overlain conformably by a well-defined sandstone which is here considered to be the basal member of the Ferntree Formation now to be described.

3. *The Ferntree Formation.*—The pebbly mudstones of the Woodbridge Formation pass abruptly up into a sandstone band, which, from the air photos, is conformable with the underlying pebbly mudstones. The sandstone is a yellowish-grey, fine even-grained rock, which under the microscope consists of angular grains of quartz and clear unaltered plagioclase in approximately equal amounts. Fossils may occasionally be found near the base of this sandstone. It is overlain by white unfossiliferous mudstones which extend to the south of the London Marsh homestead. It is probable that this sandstone horizon represents the *Risdon Sandstone* (Carey & Henderson, 1945), which is considered by Carey and Henderson to lie at the base of the Ferntree Mudstone Formation as defined by Lewis (1946, p. 34). Above this sandstone the white mudstones are comparatively free of pebbles and the rocks are lithologically similar to the Ferntree Mudstones of the Hobart District.

The above is a description of the section of the Permian lying to the west of the Forest Dale Fault. To the east of this fault the rocks are interbedded pebbly mudstones and sandstones which I have not been able to correlate with the sequence to the west of the fault. The only fossiliferous horizon found was a narrow band of dark grey shaley mudstone with *Spirifer* and rare *Fenestellidae* exposed in the bed of the Serpentine Creek at 50 chains south-east of the Forest Dale homestead. This appears to be a poorly fossiliferous equivalent of the Granton facies of the Marlborough Series.

B. *Triassic Sediments.*—Triassic sediments, consisting in the main of quartz sandstones with minor amounts of micaceous shales containing *Phyllotheca* occur in a number of places in the mapped area. The most general occurrence is in the form of elongated strips generally with a meridional trend, flanked to east and west by dolerite, and the regional dip is always to the east. These Triassic strips are separated by wide expanses of dolerite in which the structure is not determinable with certainty, and this, together with the paucity of fossil remains makes the matter of correlation of the Triassic from place to place in this area

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* *Permian Nomenclature.*—Voisey (1938, p. 314) has called the unfossiliferous glacial pebbly mudstones which overlie the fossiliferous Granton-Grange limestones the Woodbridge Glacial Stage, whereas Lewis (1946, p. 32) refers to the same group as the Lindisfarne Stage. The overlying non-pebbly mudstones have been called the Lindisfarne Stage by Voisey (1938, p. 314), and Ferntree Stage by Lewis (1946, p. 34). In order that these anomalies in nomenclature be cleared up it is suggested here (with the concurrence of Drs. A. H. Voisey and S. W. Carey) that:—

1. Voisey's name *Woodbridge* be retained for the pebbly mudstone formation overlying the fossiliferous Grange-Granton limestones.
2. Lewis' name *Ferntree* be retained for the overlying non-pebbly mudstone formation.
3. The name *Lindisfarne* about which there is some ambiguity in both Lewis' and Voisey's classifications be allowed to lapse.

very difficult. There are six main occurrences of Triassic sediments together with a number of small inliers which appear to be xenolithic bodies in the dolerite. The Triassic rocks to the east of the Marlborough fault will be dealt with first because their relationships to the Permian rocks are more evident.

(i) *The London Marsh-Seven Mile Creek Belt.*—At 15 chains south of London Marsh homestead (811N., 447E.) the white Permian mudstones pass under the flat-lying dolerite sill, the contact here being a concordant intrusive one. At 56 chains south along the London Marsh track from this contact the dolerite is overlain by a dark-grey to black flinty hornfels which extends for approximately one mile further south and to London Marsh on the east. This area of approximately 300 acres of flat country sloping gently down to the east is covered with a veneer of this flinty rock. The dolerite around the margin of this hornfels sheet is very fine-grained and closely jointed and the hornfels area is considered to represent a veneer of hornfelsed mudstone overlying a dolerite sill. The hornfels is a very fine-grained dark-grey to black flint-like rock with a thin weathered skin of earthy, yellowish-grey clayey material. Under the microscope the original clastic nature is evident in the presence of innumerable minute quartz and clear unaltered plagioclase grains of silt grade and an occasional larger quartz grain to 0·3 mm. diameter embedded in a very fine-grained indeterminable groundmass representing reconstituted clay.

Similar dark-coloured hornfelses occur at the junction of quartz sandstones with dolerite at 806N., 450E. These sandstones are lithologically similar to the Triassic sandstones to the west of the Marlborough fault and because of this occurrence of hornfels associated with quartz sandstones the London Marsh hornfelses are considered to be at the base of the Triassic or the extreme top of the Permian Ferntree Mudstone Formation.

White quartz sandstones outcrop to the south-east of the London Marsh hornfels area and are exposed along the Lyell Highway between 793N., 449½E., and 798½N., 450½E. This sandstone belt has a meridional trend with a concordant contact with the dolerite to the east. In addition, it contains several dolerite sills and the sequence of sandstones and dolerite sills is truncated along the western margin of this belt by dolerite.

This sandstone is a white even medium-grained rock consisting almost entirely of detrital quartz, which, on exposed surfaces has a sparkling appearance. Microscopic examination of similar " sparkling " sandstones from west of the Marlborough fault indicates that the original detrital quartz grains were rounded, but have suffered secondary enlargement, the secondary quartz being in crystalline continuity with the detrital quartz and developing actual crystal faces which are responsible for the " Sparkling " lustre of the rock surface. These sandstones are completely barren of fossils and are considered to be Triassic on lithology (similar sandstones overlie Triassic *Phyllotheca*-bearing shales in the Triassic belt north of Bronte) and its position with respect to the undoubted Permian rocks near London Marsh farm.

(ii) *Duck Creek Belt.*—This is a narrow belt, 15 chains wide, of white unfossiliferous quartz sandstone, occurring along the Lake Echo road north of its junction with the Lyell Highway. This belt also trends north and south parallel to the strike of the sandstones which dip flatly (3° to 6°) to the east. This sandstone, which is lithologically similar to those of the Seven Mile Creek belt is overlain both to the east and west by dolerite so that its top only is exposed. South of

the Lake Echo turn-off the Tertiary basalts cover the sandstones and dolerite unconformably, but the older rocks re-appear from below the basalt at 2·4 miles due south of the road junction, and here again the sandstone is overlain by dolerite. The sandstone immediately below the basalt is contact metamorphosed to a dense greyish quartzite.

(iii) *Bronte (Upper Nive) Belt.*—There is a well-defined belt of Triassic sediments running due north from Bronte to the northern margin of the mapped area. The belt is very narrow at Bronte, but widens to one and a quarter miles near the junction of the Nive and Pine rivers. The general strike within the belt is again north-south with an easterly dip of 10°, but near the northern edge of the mapped area the Triassic forms an elongated synclinal basin, truncated along its eastern margin by the Marlborough fault—the westerly dip on the eastern limb of this fold probably being a drag effect, reversing the regional easterly dip, on the Marlborough fault.

There are two distinct facies of the Triassic represented in this belt, the stratigraphically lower part being a clayey facies, the stratigraphically higher part being arenaceous.

(*a*) The clayey facies:—consists of white to dark-grey and black shales with a minor development of pale greenish shales and light coloured sandy shales with fine-scale current bedding and ripple marking. The shales in places are very micaceous and occasionally carry remains of *Phyllotheca*. Towards the top of this argillaceous formation the shales becomes very dark-coloured, with abundant very poorly preserved plant remains (not determined) and contain a thin coal seam. This coal is exposed in a small borrow pit on the west side of the road at 812·8N., 444·6E.

The Triassic shales of this belt are intruded by a number of thin dolerite sills and the alternation of soft shales and resistant dolerite has led to the development of dip-slope topography. This shale belt is overlain conformably by dolerite, the dolerite at the contact being fine-grained microporphyritic and, therefore, clearly the chilled base of a dolerite sill. This dolerite sill is approximately 400 feet thick and is overlain conformably by the arenaceous facies of the Triassic now to be described.

(*b*) The arenaceous facies:—the rocks of this group are very uniform lithologically, being white "sparkling" current-bedded quartz sandstones which in places show evidence of contemporaneous slumping. The sparkling lustre of these rocks is due to the secondary growth to euhedral crystals of the rounded detrital quartz grains as has been described above. These sandstones are estimated to have a stratigraphic thickness of approximately 500 feet. The contacts with the dolerite both above and below are concordant intrusive as evidenced by the occurrence of microporphyritic dolerite at the contacts. In addition, discordant dolerite dykes connecting the dolerite sills above and below the sandstones occur in this locality. These sandstones are truncated to the east by the Marlborough fault and, due west from Forest Dale Farm, are in direct contact with the Permian sediments (fig. 1).

In the bed of the Nive River from its confluence with Serpentine Creek for a distance of 30 chains to the north we find quartz sandstones associated with the shales. This is a very disturbed zone in which the sediments dip at angles up to 55°. In this zone the sandstones (on the west) which appear to overlie *Phyllotheca*-bearing shales (on the east) are probably part of a downfaulted block from the

quartz sandstones higher in the succession. Nowhere else in the area examined has this arenaceous facies been seen associated with the *Phyllotheca* shales. The sequence of rocks here is:—

'Sparkling' quartz sandstone.

?Fault — — — — — — — —

Dark-gray *Phyllotheca* shales.

Pale greenish sandy limestone ('Fontainebleau' sandstone).

Interbedded white and dark-grey *Phyllotheca*-bearing shales and ripple-marked siltstones or sandy shales showing also fine-scale cross-bedded structure.

The occurrence of sandy limestone associated with the *Phyllotheca* shales here is of interest because it is the only place in the area surveyed where calcareous rocks occur associated with the Triassic shales (except in the detrital materials underlying Big Marsh, which are described below). This sandy limestone is a light greyish colour, fine-grained and massive, and the Fontainebleau structure can be faintly distinguished on the freshly broken surfaces. The sand grains of this rock are angular and consist predominantly of quartz with a little fresh plagioclase and muscovite.

Discontinuous outcrops of Triassic sediments occur along the southerly extension of this belt. The country to the south of Bronte is flat-lying and in places marshy—the Bronte marshes, Brady's Marsh, and Big Marsh are situated in this belt. There are a few sporadic outcrops of well-lithified sandstone along the eastern margin of the Bronte marshes between distances of two and two and a half miles south of Bronte. The sandstones occur only in the form of scattered boulders but in one place an outcrop of sandstone, overlain by dolerite, was found. These sandstones are coarse gritty consisting predominantly of quartz with minor amounts of turbid felspar and rare flakes of muscovite and biotite. Whether these sandstones are merely isolated xenoliths in the dolerite or form part of a stratum underlying the dolerite is not apparent from the occurrence examined.

The nature of the rock underlying Brady's Marsh is unknown, but boulders of sandstone and dark-coloured hornfels found approximately half a mile south-east from the southern end of the marsh indicate that these rocks may underlie Brady's Marsh. Big Marsh, situated to the south-west of Brady's Marsh appears to be underlain by the Triassic sediments. The perimeter of Big Marsh is entirely of dolerite, but several shallow holes sunk with a post-hole digger in the floor of the marsh discloses well-lithified mudstone and clayey sand which may be of Triassic age. Since these bores are of some significance in connection with the origin of the marsh the results are given here—

Bore A. (near the southern end of the marsh):

From surface to 1′ 6″: Black peaty clay.
1′ 6″ to 2′ 3″: White clay of uniform texture.
2′ 3″ to 3′ 0″: Yellow clay with some iron-stained sandy material.
3′ 0″ to 4′ 0″: Grey clay with uniform texture.
4′ 0″ to 4′ 10″: Grey clay with shale (mudstone) fragments.

At 4′ 0″ this hole entered the solid floor of the marsh as it was found very difficult to get the digger down the next 10 inches, the spoil from which was mainly grey mudstone fragments. This rock was a dense, grey, non-calcareous, non-sandy well-lithified mudstone containing muscovite flakes and a few obscure plant fossils which may possibly be *Phyllotheca*. It is most probably Triassic, but in view of the obscurity of the fossils this is by no means certain.

Bore B. (centre of Big Marsh):

From surface to 1′ 6″: Black peaty clay.
1′ 6″ to 7′ 6″: Greyish clayey sand.

A laboratory examination of the material from the bottom of this hole indicates that it is a slightly calcareous sandy clay in which there is approximately 50 per cent of fine sand grade material. These sand grains are angular, but strongly frosted there being very few grains with unworn surfaces. Turbid felspar is the predominant mineral and quartz is next most abundant. Some contorted mica flakes are present. The heavy minerals were separated in order that they could be compared with those of an undoubted Tertiary sand interbedded with the basalts to the west of the River Nive. The heavy mineral index was low and contained a very small proportion of slightly magnetic ilmenite (as compared with the high ilmenite content of the Tertiary sand). In view of its low ilmenite content and absence of pyroxene it appears to be pre-dolerite and, therefore, not of Tertiary age. The other heavy minerals in the sample are:—

(i) Opaque, non-magnetic, very turbid, unidentified.
(ii) Zircon, perfect euhedral unworn crystals, slightly yellow in colour.
(iii) Garnet, colourless isotropic, chunky, unworn.
(iv) Biotite—rare worn flakes.

This examination of the materials from the floor of Big Marsh indicates that it is underlain by Triassic sediments rather than by dolerite (the only rocks exposed around its margin) or by Pleistocene till. More detailed work, however, is required to substantiate this conclusion.

The country to the south of Big Marsh is entirely of dolerite.

(iv) *Middle Nive Belt.*—A narrow belt of shaley Triassic sediments with some associated current-bedded sandstones is exposed in the Nive valley between Tarraleah and the mouth of the Clarence River. This belt, the eastern and western margins of which are, for the most part, concordant igneous contacts with the underlying and overlying dolerite, is cut across by discordant dolerite intrusions connecting the dolerites above and below the sediments. A result of the transgressive dolerite has been, therefore, to break the narrow belt of sediments up into three or four elongated blocks thus:—

(*a*) At the mouth of the Clarence River: Triassic sediments are exposed in the bed of the Nive for a distance of 30 chains upstream from the mouth of the Clarence where they end abruptly against a discordant east-west dolerite intrusion. These sediments strike 25° (magnetic) and have a uniform dip of 12° to the east. The eastern margin of the sedimentary band is a concordant intrusive contact with Triassic sediments below and dolerite above. The western margin exposed on the north bank of the Clarence at 10 chains from its junction with the Nive and 10 feet above river level appears to be a shelving discordant igneous contact dipping 20° to the N.W., whereas the bedding of the sediments here dips very flatly to the east. This contact is definitely intrusive, the dolerite being the chilled microporphyritic variety.

The Triassic rocks exposed in this section of the Nive are greyish graphite-bearing clayey siltstones near the west edge of the belt (i.e., the lowest part of the sequence). At eight chains north of the mouth of the Clarence the mudstones and siltstones are overlain by hard current-bedded white quartz sandstones. These in turn are overlain at 16 chains north of the Clarence-Nive junction by white mudstones and siltstones, and still further upstream (i.e., higher in the Triassic succession) by greenish-grey well-jointed mudstones with layers to two feet

thick of sandstone. No fossils have been found in the rocks exposed near the mouth of the Clarence River, but because of lithology and the occurrence of flake graphite in the siltstones of the lower parts of the sequence here exposed they are considered to be of Triassic age. These sediments have not been followed to the south, but appear to pass under the basalt cover and may join up with the next section to be exposed downstream in Wentworth Creek.

(*b*) In Wentworth Creek and downstream along the River Nive: Triassic *Phyllotheca*-bearing shales and associated current-bedded siltstones and sandy shales very similar to those exposed north of the Bronte Gorge have been traced from a point approximately three-quarters of a mile upstream along Wentworth Creek from the Nive for a distance of approximately three miles downstream along the Nive River. The Triassic here is a band approximately 100 feet thick which outcrops over a width averaging 10 chains between two intrusive dolerite sills. The best section exposed is in the Nive at 20 to 30 chains upstream from the mouth of Wentworth Creek, where the Nive has a south-westerly trend oblique to the strike of the sediments. The base of the section here, which is well-exposed on the west bank of the Nive, consists of thin interbedded light and dark grey shales in which *Phyllotheca* is comparatively abundant. *Phyllotheca* was also found in very micaceous shales in Wentworth Creek three-quarters of a mile upstream from its junction with the Nive.

The Triassic sediments of this belt dip to the east at 5° to 10°, but in the outcrops of Triassic sandy shales and siltstones in the bed of the Nive between half a mile and one mile south of the Nive-Wentworth junction the dips are very steep (up to 55° being noted). This is due probably to these rocks being in the immediate vicinity of the Nive fault. At one and three-quarters miles downstream from the Wentworth-Nive junction the sediments are cut off abruptly by a discordant dolerite intrusion approximately 10 chains wide, south of which the sediments continue for a short distance before becoming lost under the dolerite talus of the east bank. The sediments near this southern end of the belt being described are fine-scale current-bedded sandy shales best exposed on the east bank of the river, and are lithologically identical with the Triassic exposed to the north of Bronte Gorge. No further trace of these sandy shales has been found downstream, although a sandstone facies, presumed to be of Triassic age, has been found a short distance below Tarraleah Power Station.

(*c*) Tarraleah Power Station occurrence:—Coarse gritty sandstones are exposed on the west side of the Nive Valley a few chains south of the pipeline leading to the Tarraleah Power House and a fine-grained sandstone occurs on the east side of the Nive at approximately 20 chains downstream from the powerhouse—elsewhere in this locality the rocks are completely covered with talus.

The sandstone on the west bank of the Nive is a conglomeratic sandstone containing waterworn pebbles to 1 cm. diameter. It outcrops in a cliff 25 feet high immediately below the basalt (at an approximate elevation, 1500 feet) at approximately two chains south of the pipeline. No sandstone is exposed on the pipeline itself—dolerite is the only rock and it is very fine-grained and it appears that here again we have a discordant east-west contact of sediments and dolerite. The sandstone strikes 75° (magnetic) and dips 10° to the south. It is current-bedded, the attitude of the current bedding indicating that the source of the sediments was to the north-west. It is a much coarser facies than the sandstone of the east bank of the Nive below the powerhouse, but has thinner-bedded layers in which flake graphite can occasionally be seen and in this respect is similar to the sediments of the east bank. The sandstone is very quartzose, but carries a small proportion (less than five per cent) of clear microcline. That this sandstone is underlain by

mudstone is evidenced by the finding of a small fragment of yellow-brown mudstone approximately 50 feet above river level at 10 chains south of the powerhouse. The west bank of the Nive was traversed for approximately one and a half miles below the powerhouse, but no further sediments were noted beyond a distance of 25 chains—south of this point solid dolerite and dolerite talus was the only rock seen.

The Triassic sandstones of the east bank of the Nive below the powerhouse are fine even-grained micaceous quartz sandstones carrying a little flake graphite and are, therefore, referred to the Triassic. The strike is 330° (magnetic) and dip 22° N.E. All contacts with the dolerite here are covered with dolerite talus.

(v) *Lower Nive Belt.*—In the extreme south-east corner of the mapped area a series of easterly dipping unfossiliferous greenish to chocolate shales with irregular lenses and sills of dolerite occur outcropping in the road cuts on the Tarraleah-Ouse Highway to the east of the Nive bridge. These are tentatively correlated with the Hamilton Shale Facies of the Knocklofty Formation of the Triassic, the correlation being based on lithology and the irregular nature of the dolerite intrusions within the shale which is a rather characteristic feature of the Hamilton Shale Facies (S. W. Carey, personal communication). These shales strike obliquely to the dolerite-shale contact, they show no contact metamorphic effects, and the dolerite is medium-grained at the contact, so it is considered that the contact between the main dolerite mass to the north-west and the shales is a fault (Nive Bridge Fault), which strikes in an E.N.E. direction.

(vi) *Butler's Gorge Belt.*—A belt approximately one and a half miles wide of Triassic quartz sandstones occurs to the east of Butler's Gorge townsite. It has a general north-south trend, but nowhere do the sandstones form good outcrops except in the bed of the Derwent River in the vicinity of 796N., 428E., where the overlying soil cover has been completely scoured away and the rocks are wonderfully exposed—they show very clearly in the air photos. They dip at 10° to the north-east, but near the western margin of the belt the dip steepens to 20° or 30°. Outcrops of the more steeply dipping sandstones are exposed in the sand quarries to the north of the main road at approximately one mile N.E. from Butler's Gorge. The true dip here is 20° N.E., but some steeper dips of 35° were noted—these may be due to very large-scale current bedding, but they more probably represent local steepenings in the regional dip. Exposures along the transmission line are very poor, the presence of the sandstone being indicated only by boulders and pebbles.

Nowhere has the actual contact of the sandstones with the dolerite to east and west been seen. Because of the occurrence of fine-grained dolerites along the western margin it is possibly an igneous contact, but this is by no means certain. The eastern margin is probably a faulted contact (the Wentworth Fault). This belt of sandstones has been traced to the north to beyond the transmission line but no trace of these rocks could be found on the Lyell Highway to the east of Derwent Bridge. Traverses to several miles south of the Lyell Highway at points where the sandstones were expected to be found indicated that the entire area here is of dolerite—probably largely residual from glacial deposits which cover extensive areas hereabouts.

The sandstones of this belt are essentially quartz sandstones with subordinate felspar. In places they become very clayey as in the westernmost part of the sand quarries one mile N.E. of Butler's Gorge. These quartz sandstones commonly show current bedding, which dips fairly constantly in the direction of 140° (mag.) indicating that the source of the material was from the north-west. In certain layers they contain small flat clay (shale) pellets. A little flake graphite was noted in some specimens from the western margin of this belt on the transmission line.

The detrital grains in these sandstones are generally angular indicating quick accumulation. No fossils have been found in any of the rocks from this belt so that no certain determination of their age is possible. Lithologically, however, they resemble the Triassic sandstones and they have, therefore, been assigned to this group. The presence of a little flake graphite may indicate that it belongs to the Knocklofty Sandstone Formation, but the thickness is more indicative of the Ross Sandstone Formation. The thickness of the Triassic sandstones exposed in this belt is approximately 1500 feet, much greater than any other Triassic exposure elsewhere in the country near Tarraleah.

Minor Occurrences of Triassic Rocks.—As has been noted earlier there are small occurrences of presumably Triassic sediments irregularly scattered throughout the dolerite. It is probable that there are many such small occurrences that are obscured by the thick timber and soil cover. For example, if it were not for the exposure by a small borrow pit of the sandstones on the west side of the road running north from Tarraleah at 10 chains south of the transmission line, their occurrence here, where the soil is covered by detrital dolerite boulders, would never have been suspected. The sediments exposed in this quarry consist of very friable sandstone which is only slightly lithified, overlying a brownish grey mudstone containing a little flake graphite. These mudstones bear some similarity to the Hamilton Shale Facies of the Knocklofty Formation of the Middle Triassic. The brownish mudstones outcrop in a drain on the west side of the road near the quarry and were proved to extend under the sands in the quarry by a hole put down to three feet with the posthole digger. These sediments, which are very flat-lying, extend to the east of the road as proved by another hole put down at about four chains east of the quarry. The friable sandstones in the quarry are intruded by dolerite and have been contact metamorphosed. The microscopic examination of this sandstone indicates that it is a quartz-felspar sandstone with a considerable amount of clear unaltered microcline and in containing microcline it is similar to the sandstones exposed near Tarraleah powerhouse. The most probable origin for this small patch of Triassic rocks is that it is an inclusion which has been broken off the roof of the dolerite sill and sunk into the dolerite magma forming a xenolith.

C. *Jurassic Dolerite.*—Dolerite is the most widespread of the rocks developed in this area. The various contacts of the dolerite with the small inliers of Permian and Triassic sediments have been described above. With a few exceptions the contacts are concordant and the dolerite masses appear to be sills connected in places by dyke intrusions (as in the Nive Valley upstream from Tarraleah). Near Forest Dale Farm on the Marlborough Highway the dolerite has arisen in the form of a dyke along the Forest Dale Fault. The characteristic vertical columnar structure of the dolerite sills is rarely visible in this area because of the plateau nature of the topography and the absence of scarps in this region. The west face of the Wentworth Hills to the north-east of Butler's Gorge is, however, a high scarp, probably a fault scarp, and here the typical columnar structure of the dolerite is clearly visible. The east face of the Wentworth Hills is a dip slope of the top of the dolerite sill so that there can be little doubt that the extensive area of dolerite between the Wentworth Hills and the River Nive is part of a single sill of dolerite. The dolerite throughout the region is much jointed and flat, easterly dipping joints (" bedding joints ") are common throughout the area, supporting the conclusion that the form of the dolerite is mainly concordant intrusions.

The petrology of the Tasmanian dolerites has been dealt with fully by Edwards (1942) and there is little to be added here except in connection with the significance of grain-size criteria for the determination of the nature, whether faulted or

intrusive, of the contacts between the dolerites and the associated sedimentary rocks. At the actual igneous contacts the dolerite is very fine-grained, dense, and microporphyritic, consisting of small phenocrysts of olivine, augite, and plagioclase in an aphanitic groundmass. Under the microscope the texture is glomeroporphyritic, the augite and plagioclase phenocrysts being clustered together. The olivine phenocrysts are euhedral and extensively altered to pale green serpentine. The groundmass is a microcrystalline intergranular aggregate of plagioclase laths and pyroxene granules. Such basaltic olivine dolerite is confined to a distance of several feet only from the intrusive contact—beyond this the dolerite is coarser and grain size is not significant in determining whether the contact is intrusive or faulted. There is a tendency even in dolerite remote from contacts with the sedimentary rocks to be comparatively fine-grained with irregular segregations of coarser material. Coarse and fine dolerite specimens can be collected from the same boulder and this indicates that the grain size criterion for determining the nature of a contact between the sediments and dolerite here must be applied with caution. The occurrence of the microporphyritic olivine dolerite at the actual contact is, however, indisputable evidence that it is an intrusive rather than a faulted contact.

D. *Tertiary Rocks.*

(i) *Basalts.*—A series of horizontal olivine basalt lava flows overlies the Pre-Tertiary rocks unconformably. In the area examined they are confined to two distinct belts, the main belt trending parallel to the River Nive and the other belt, exposed only on the eastern margin of the area, along Duck Creek. Since only the western fringe of the Duck Creek basalt belt lies within this area it will not be described in detail and the remarks given here deal entirely with the Nive belt.

West of the Marlborough Fault the basalts are confined to a more or less north-south trending belt of country up to five miles wide along the Nive valley. The most extensive basaltic area is in the vicinity of Bronte where the basalts cover a more or less circular area approximately three and a half miles in diameter. This area has been flooded with basalt and subsequently cut through by the River Nive, which exposes a vertical thickness of basalt of approximately 330 feet. This basalt-covered area is walled in by higher dolerite hills to the west, north and east, and in Plate II., fig. 1, these hills can be seen rising above the level of the basalts.

Within the area mapped there are sporadic occurrences only of basalt to the north of the Bronte plains, but still further north beyond the margin of the accompanying map there are more extensive occurrences of basalt. South from the Bronte basalt-covered plains there are several prolongations of the basalt. One of these runs almost due south from Bronte as far as Nive Marsh (two miles north-east of Tarraleah village). Near its junction with the main basalt basin at approximately one mile south of Bronte this basalt belt is narrow (about 25 chains wide), but it broadens to the south so that at two miles south of Bronte it is approximately 100 chains wide. At three and a half miles south of Bronte it again narrows to 30 chains being interrupted by a ridge of the underlying dolerite and south of this point it again broaden to a belt one and a half miles wide to the west of Brady's Marsh. It is here that the basalts are best exposed (in Brady's Creek). South of Brady's Marsh this basalt belt pinches out except for several small outliers near Nive Marsh. Within this belt the basalts are thicker on the eastern than on the western margin, having apparently flowed into an elongated depression with an asymmetrical profile.

The other main prolongation from the Bronte basaltic area is from the southwest segment along the west bank of the Nive. This belt follows the west bank of the Nive throughout the entire area mapped. In places where west bank tributaries enter the Nive they have cut down through the basalts and exposed the underlying dolerite or sediments—in this way the Clarence River, and Wentworth and Horne's Creek have exposed the underlying dolerite which interrupts the basaltic belt. Throughout the length of this belt the basalt is thick along its eastern margin and thin along the western margin (fig. 4)—in other words the depression that has been filled by the basalt outpourings was of asymmetrical profile. This increase in thickness of basalt from west to east in both the belts that have been mentioned allows of two interpretations:—

(*a*) That these asymmetrical depressions are due to faults trending in a north-south direction with downthrow to the west and tilting of the fault blocks to the east.

(*b*) That these asymmetrical depressions are due to dip slope-escarpment topography resulting from the differential erosion of hard dolerite and softer sediments which have a gentle easterly regional dip.

Of these two hypotheses the second is preferred because:—

1. The depressions now filled with basalt trend in a general northerly direction, transgressing the N.W. trending fracture pattern in the dolerite.
2. Basalts have flooded over the northerly extension of the Nive Fault.
3. The regional dip throughout the area covered with basalt is flat to the east so that any pre-basalt topography carved out of alternately hard and soft beds would be likely to have flat dip slopes on the western sides of north-south valleys with steep escarpments on the eastern sides of such valleys.

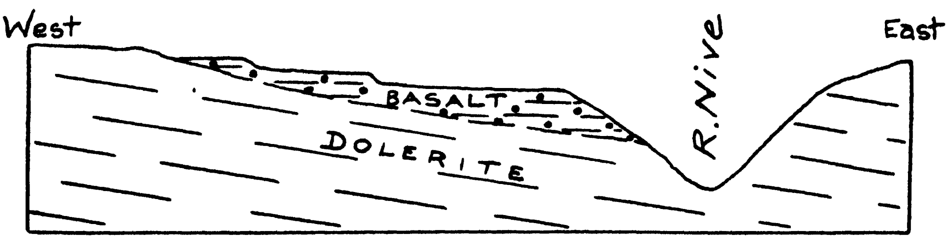

FIG. 4.—Diagrammatic cross-section of the Nive basalt belt to illustrate the structure of the basalt filled area which was in pre-basalt times an asymmetric valley with dip slope to west and escarpment to the east.

The basalt has a horizontal structure and is the result of a number of successive outflows of lava which yielded flows of the order of 50 feet thick, rather than a single basalt flood. In the course of the reconnaissance survey of this area it was impossible, because of time limitations, to map the separate flows and different basalt types which appear to be merely structural and textural variations due to the position of the basalt within a flow, i.e., scoria and scoria-breccia at the top and the more massive types lower in the flow. All of the basalts are olivine-bearing and the following textural types can be recognised:—

(*a*) *Massive, non-vesicular, olivine basalts* characterised by well-developed columnar jointing. These are almost black in colour, very fine-grained, non-vesicular and characterised by abundant small olivine phenocrysts which can be distinguished megascopically.

(*b*) *Micro-vesicular olivine basalts* of greyish colour, with minute reddish brown specks uniformly distributed throughout. These basalts have numerous very small irregular shaped vesicles. The noticable reddish brown specks are due to slight alteration of the tiny olivine phenocrysts to iddingsite.

(*c*) *Scoriaceous basalt* greyish in colour and characterised by numerous spherical vesicles to 5 mm. diameter. These, together with the scoria-breccias form the surface crust of the more massive flows.

(*d*) *Scoria-breccia* similar to the scoriaceous basalts, but having a fragmental structure. They are deposits of scoria fragments which have been weakly cemented by clayey material which is probably finer volcanic debris.

The best section of the basalts exposed in the area mapped is that in Wilson's Creek below the Tarraleah Forebay pond. This stream exposes a vertical thickness of approximately 600 feet of basalt. At approximately halfway down this section a thin band of greenish Tertiary sandstone was found interbedded with the basalt and at the base of the basalt a small outcrop of richly fossiliferous mudstone containing fossil leaves of the *Fagus* flora was found. These sub-basaltic mudstones with the *Fagus* flora are probably the equivalent of Lewis' Geilston Stage of the Late Miocene in the Hobart District (Lewis, 1946, p. 45), and thus the basalts are of Pliocene or later age.

Basalt Dykes in Dolerite.—In several places (e.g., in Horne's Creek at (797·8N., 438E.), Wentworth Creek at (799N., 438E.), and the River Nive at 804N., 439·8E.)), basaltic material was found associated with the dolerite. Nowhere was the basalt seen in direct contact with the dolerite, but the occurrence of very large blocks of basalt to 20 feet or more in length against the solid dolerite appear to be dyke intrusions, although the possibility that they are collapsed blocks from the higher valley walls must not be overlooked. The occurrence of basaltic rock in the River Nive at (804N., 439·8E.), can be clearly traced as a dyke on the air-photos—unfortunately, a specimen was not obtained of this material in the course of the field survey so that it cannot be petrologically compared with the rock from Horne's Creek. The basaltic dyke rock of Horne's Creek is very dense, dark grey to black, with rare olivine grains 2 mm. diameter and white zeolite amygdales to 3 mm. diameter. Under the microscope the constituents are olivine and pyroxene in approximately equal proportions, plagioclase laths and opaque iron ore. The olivine is fresh unaltered and euhedral and occurs in larger grains than the pyroxene towards which it is idiomorphic. It contains more olivine than the chilled microporphyritic selvages of the dolerite sills and appear to be more comparable to the olivine basalts than to the dolerites. These dykes, it is suggested, occupy the feeding channels through which the Tertiary basalts have been erupted.

(ii) *Sediments.*—There are two main types of occurrence of Tertiary sediments in the mapped area:—

(*a*) Interbedded with and lying below the Tertiary (? Pliocene) basalts. These comprise clays and sands which in one place (in Wilson's Creek at (790N., 441·5E.)), are richly fossiliferous, carrying abundant fossil leaves of the *Fagus* flora. Unfossiliferous inter-basalt clays and sands occur along the road running north from Tarraleah to the Lyell Highway, but the occurrences are too small to be indicated on the accompanying map. The main type of sediment is clay. Sands are very rare, but one interesting occurrence of sand interbedded with basalt occurs on the west side of the Tarraleah to Lyell Highway road at (808·6N., 438·3E.). The

sediments here are loose unconsolidated sands in a band four to five feet thick interbedded with the basalt. It is a fine sand with the following mechanical composition:—

Retained on Tyler Screen No.	Mesh opening (mm.)	Weight (gms.)	Weight %	Cumulative weight %
32	0·495	0·06	0·12	0·12
60	0·246	19·56	39·12	39·24
115	0·124	22·20	44·40	83·20
250	0·061	0·78	1·56	85·20
passed 250		7·40	14·80	100·00

The products of the grading analysis were examined microscopically, thus:—

On 60 mesh:—Grains mostly angular, equidimensional, some show slight wear and frosting. Many grains have original crystal faces present. Consist entirely of quartz.

On 115 mesh:—Similar to that on 60 mesh, but a few grains are perfectly rounded and frosted indicating wind transport. Many grains have original crystal faces. There are, therefore, two distinct crops of detrital grains present. Consists entirely of quartz.

On 250 mesh:—Consists predominantly of quartz, but carries a small proportion of "heavy" minerals. The quartz is mostly sharp and angular as in the coarser grades, but some are rounded and frosted, indicating wind action. The heavy black minerals can be separated with a small electro-magnet, but they are not sufficiently magnetic to be magnetite and since they yield positive tests for both Fe and Ti these grains are presumably ilmenite.

From these characteristics it is evident that this sand has not suffered much transport before deposition and that the grains have been derived from two sources, one crop having suffered no transport the other having been subjected to wind transport.

The Tertiary age of these sediments cannot be doubted because of their association with the Tertiary basalt and the occurrence of leaf fossils *(Fagus)* in the Wilson's Creek mudstone.

(*b*) Occurring in areas remote from the Tertiary basalts. The main occurrence of these Tertiary sediments is along the south side of the Derwent Valley east of Butler's Gorge. The sediments here include slump-folded and current-bedded sandstones and shales with interbedded conglomerates. These rocks outcrop for a distance of two miles along the south bank of the River Derwent and near the eastern margin of the occurrence they extend to the north bank of the river where there are several very good exposures. These sediments are well-lithified and at first glance appear to be Triassic, but they overlie the Triassic sandstones and dolerites unconformably and moreover occasionally contain dolerite pebbles in the conglomeratic layers. They are horizontally bedded, but show slump-folding and, especially in the conglomeratic layers, current bedding. The slump folding indicates a surface of deposition sloping down to the north-west and the current bedding indicates that the source of the detrital material was from the north-east. Because of the absence of fossils the age of these sediments cannot be fixed exactly, but the occurrence of dolerite pebbles in the conglomerates indicates that they are definitely post-Mesozoic and they are put down tentatively here as Tertiary. Their age with respect to the basalts is unknown. These sediments are overlain by a light yellowish sandy soil which extends over the flat-lying country to the south of the Derwent. This sandy soil is made up of fine sand with angular grains and has a comparatively high heavy mineral content (10·2 per cent by weight of

the total sample), which consists largely of angular pyroxene grains with a minor amount of opaque iron ore and a few odd grains of pinkish garnet. The heavy mineral crop, with the exception of the garnet, is undoubtedly almost entirely derived from the breaking down of dolerite. The light fraction consists largely of quartz with minor turbid felspar and, in the grades coarser than 115 Tyler Mesh, consists of approximately equal proportions of angular unworn grains and sub-rounded frosted grains. On the whole the light sand grains are poorly rounded and the detrital materials have suffered but little transport. These materials have resulted from the quick accumulation of sediments in a depression lying to the west of the Wentworth Fault, the development of which was probably due to the Wentworth Fault downthrowing to the west.

E. *Pleistocene and Later Rocks.*—The Pleistocene rocks in this area are glacial tills which have been recognised in the westernmost parts of the mapped area only. These tills occur as a thin veneer overlying the older rocks (Triassic sandstones and Jurassic dolerites) and cover extensive areas along the Derwent north of Butler's Gorge, along the north bank of the Derwent east of Butler's Gorge, and to the south of the Lyell Highway in the vicinity of Derwent Bridge. The country covered by these glacial deposits is characterised by a bouldery surface in which the dominant boulders are of dolerite. Quartz boulders, however, occur occasionally and their presence can always (in this area) be regarded as indicative of the glacial tills and they serve to indicate the origin of the dolerite-boulder strewn areas, i.e., whether they are glacial or due to the normal breakdown of an underlying dolerite (which is the predominant rock type of the area). The Pleistocene till is often overlain at the surface by Buttongrass swamp areas a number of which were sampled by the post-hole digger. The till consists of material varying in grade from large dolerite boulders down to the finest clay and a laboratory examination was made of the sand fractions of some of these tills. So far as the sand content of the tills is concerned all the samples are similar and the following description of a sample from depth 30 inches in the marsh at (796·3N., 429·8.E), can be regarded as typical of this rock.

It is an iron-stained yellowish sandy clay with fragments of dolerite to two inches in diameter and quartz to a quarter of an inch diameter. After the clay fraction is removed there is a considerable sandy residue of poorly graded material varying from very fine up to an eighth of an inch diameter. The minerals of this sand fraction are predominantly quartz with subordinate felspar (including some microcline). The larger grains show very little abrasion and on the whole the grains are very angular, many having their original crystal faces present. A small proportion, however, are rounded and have a frosted surface. The heavv black minerals of smaller size are very angular and show no signs of abrasion. The occurrence of so much quartz sand in this specimen is not of marked significance since the Triassic quartz sandstones occur in their vicinity, but the presence of similar quartz sand fragments in a specimen from two and a quarter miles north of Butler's Gorge, remote from the sandstones becomes significant—the occurrence of these angular quartz grains, as with the larger quartz pebbles, is an important indicator of the glacial till.

The Derwent Valley upstream from the Clark Dam (at Butler's Gorge) appears to have been dammed with a terminal moraine in Pleistocene times—amongst the boulder accumulations which occur over a considerable area about half a mile north of the Clark Dam there are occasional large blocks (to 8 feet by 8 feet by 5 feet) of quartz schist which could have only been carried on glaciers from the older (Pre-Cambrian) formations to the west and north-west of this area.

The recent deposits in this area include river alluvium (mainly dolerite boulders) and talus deposits (mainly angular dolerite fragments accumulated along the steep valley walls of the main streams).

3. Geological Structure.

The geological structure of the mapped area is essentially a gentle easterly dipping series of sediments ranging from the Permian to the Triassic which has been intruded by thick dolerite sills, which form the predominant rocks now exposed at the surface. The dolerite for the most part appears to be in the form of easterly dipping concordant intrusions (judged by dip slopes, columnar joints, " bedding " joints in the dolerite, and conformable chilled contacts with the associated sediments), but in places the dolerites transgress the bedding of the associated sediments (e.g., in the Nive Valley north from Tarraleah) to form connecting dykes between the main sills. This easterly dipping structure, which extends over the entire mapped area is interrupted by N.-S. striking faults which have downthrows to the west. The main faults are:—

(*a*) *Marlborough Fault.*—This fault strikes in a N.-S. direction and has been traced from a point at co-ordinate position (808N., 447E.) in a northerly direction to the northern margin of the mapped area. South of the Lyell Highway the fault has dolerite both to the east and west and as a result it is very difficult to trace its exact course. This fault can be clearly seen on the air photos as it brings dolerites and Triassic sandstones on the west side into juxtaposition to the more readily eroded Permian sediments on the east. This fault is a normal one dipping steeply (approximately 60°) to the west and it throws down to the west, the estimated minimum throw being 3800 feet. It can be best seen on the south side of Serpentine Creek from a point on the Marlborough Highway at four miles from Bronte, because here the Permian is in faulted contact with dolerite. In spite of the enormous throw on this fault there is no apparent disturbance of the Permian strata in its vicinity, and the Permian Fenestella mudstones which outcrop in a horizontal layer about halfway up the valley wall can be seen to preserve their apparent horizontal attitude to the contact with the dolerite. On topographic evidence alone, one would be tempted to place the fault to the west of the west-facing escarpment, which is situated approximately five chains to the west of the contact between the dolerite and the Permian and to consider the dolerite to be a dyke. Tracing the fault to the north it will be seen, however, that due west from Forest Dale Farm, the dolerite has cut out and we have Triassic quartz sandstones against the Permian rocks and moreover at this point the fault line scarp faces east in spite of the fact that the west block is downthrown. This scarp is a fault line-scarp rather than a fault-scarp (fig. 1).

(*b*) *Forest Dale Fault.*—This fault can be traced from a short distance south of the Forest Dale homestead in a south-easterly direction for a distance of three and a half miles. This fault is pre-dolerite and has been intruded by a dolerite dyke. There is no evidence of the direction of dip of this fault nor of the amount of throw (because, as outlined above in the section dealing with Permian stratigraphy, the Permian strata on both sides of the fault have not yet been correlated).

(*c*) *Nive Fault.*—This fault is exposed on the south-east bank of the River Nive near its junction with Wentworth Creek at (797·3N., 438·8E.). This fault cannot be definitely seen elsewhere in the area, but the distortion of the bedding in the Triassic sandy shales in the bed of the Nive for a distance of one mile downstream from the outcrop of the fault indicates that going downstream the fault trends along the actual river bed. North from the outcrop of the fault the

Nive swings to the east and the fault is thought, because of deformation of the Triassic shales at three-quarters of a mile upstream along Wentworth Creek, to continue to the N.N.W. along the Wentworth. The entire belt of Triassic rocks exposed here appears to lie to the east of the Nive Fault. This fault is of interest because it can be seen clearly in spite of the fact that the wall rocks are entirely of dolerite. The fault zone (Plate VIII, fig. B), is approximately five chains wide with most of the shattering and shearing confined to a zone one chain wide. The fault is vertical and the actual fault surface is represented by a band three inches wide of slickensided green clayey gouge with dolerite breccia on the west side (Plate VIII, fig. B). The dolerite for half a chain on either side of the actual fault surface is very fractured and has many small seams of green clayey gouge and open joints which are partially filled with well-crystallised dog-tooth calcite. A petrological examination of the dolerites from this fault zone shows that the main mineralogical change in these rocks due to the faulting is in the development of greenish brown clayey material replacing the felspars. There is no apparent change in the pyroxene and at one inch from one of the gouge zones the dolerite is unaffected mineralogically. Microscopic examination of the dolerites, therefore, yields no information regarding the proximity of a fault.

A distinct flexuring of the fracture systems in the dolerite can be seen adjacent to the actual fault surface (Plate VIII, fig. B), and this flexuring indicates that the west side has been downthrown with respect to the east side. The actual amount of movement cannot, owing to insufficient data, be calculated, but it must be considerable to produce the high degree of fracturing and shearing noted.

(*d*) *Wentworth Fault.*—The west face of the Wentworth Hills (802N., 428E.) appears to be a fault scarp which continues to the south along the eastern boundary of the Triassic sandstones and thence south along the long straight southerly course of the River Derwent. From the topography the west side is downthrown and this is supported by the occurrence of Tertiary sedimentary deposits in a depression lying to the west of this fault zone. The actual existence of this fault will only be proven by further work to the north and south of the area so far mapped.

(*e*) *Nive Bridge Fault.*—The contact between the Triassic sediments and main dolerite mass, exposed at (783N., 448E.) on the Tarraleah Highway at three-quarters of a mile east of the Nive Bridge, appears to be a fault as the shales strike obliquely to the contact, they are not contact metamorphosed by the dolerite and the dolerite is medium grained. This contact (the Nive Bridge Fault) strikes in an E.N.E. direction and so is markedly different from the other faults that have been described above. From the evidence so far available in this area it is impossible to give any estimate of its displacement nor of the relative directions of movement of the two walls of this fault.

(*f*) *Fracture Pattern in the Dolerite.*—In addition to the major faults which are described above, a well marked fracture pattern is present in the dolerite areas. These fracture systems in the dolerite can be clearly distinguished on the air-photos in spite of the dense timber cover. There are two sets of these fractures, one trending N.E. and the other trending N.N.W., and they maintain very constant direction over the whole of the mapped area. When seen on the ground they consist generally of a zone to several chains wide of closely-spaced steeply-dipping joints, but some of the dark lines seen on the air-photos are actual shatter zones and another proved to be a basaltic dyke in the dolerite. It will be evident, therefore, that any such evidences of "shear" structures on the air-photos must be individually examined on the ground before one can definitely state whether they are zones of closely spaced joints, or faults, or dykes. The north-east trending

closely spaced joints dip steeply (80°) to the north-west. To this group belongs the Clark Dam Fault (Plate VIII, fig. C) exposed in the excavations for the eastern abutment of the Clark Dam at Butler's Gorge. This small fault zone strikes 55° (mag.) and dips 85° N.W., and the main shatter zone is four feet wide, parallel to which is a strongly jointed zone about 30 feet wide. Calcite veinlets one inch wide are associated with the fractures. A well-defined shatter zone belonging to the N.W. trending set of fractures is exposed in the bed of the River Nive at (803½N., 440E.)—this shatter zone is approximately one and a half chains wide and in it the dolerite is brecciated and traversed by irregular white veinlets which strike in the general direction 150° (mag.) and dip 45° to the S.W. The white mineral of these veinlets is the zeolite laumontite and appears to be the result of zeolitisation along the fractures in the faulted dolerite produced by vapours associated with the vulcanism which gave rise to the Tertiary basalts.

All of these "shear" zones seen on the air-photos are indicated on the accompanying geological map. Not all of them have been visited so that their nature (except those actually examined in the field) is not known with certainty. They appear to be conjugate fracture systems associated with the development of the major faults which, as noted above, strike in a general north-south direction.

4. Geological History of the Area.

The geological history of the mapped area began in Permian times with the deposition of the fossiliferous marine sediments of the Marlborough Series. The detrital material of these sediments was deposited from floating ice and glacial conditions continued throughout the Permian at least until the deposition of the Risdon sandstone. The overlying Ferntree mudstones, which are free from ice-rafted boulders probably indicates a decrease in intensity of the Permian glaciation.

The Permian marine sedimentation was followed in Triassic times by the deposition, in widespread lakes, of freshwater sandstones, and shales which in places carry fossil plant *(Phyllotheca)* remains. Owing to the impossibility of correlating the isolated inliers of Triassic sediments no detailed history of the Triassic Period can be attempted. The next main event was the intrusion, in the form of sills, of dolerite. This was perhaps preceded by some faulting (e.g., the Forest Dale fault was either pre-dolerite, or was developed during the intrusion of the dolerite, for it is now represented by a dolerite dyke). Subsequent to the intrusion of the dolerite there was further faulting along north-south lines resulting in the major fault structures of the area which appear to be step faults which throw down to the west. These movements may be associated with those which resulted in the general regional tilt of the rocks to the east and resulted in the well-defined fracture pattern seen in the doleritic areas.

The next major event was the extrusion of the Tertiary basalts which filled asymmetric erosion depressions on the plateau resulting from the long continued erosion of the block-faulted area. The basalts are not the result of a single eruption, but rather of a succession of fissure eruptions yielding flows of the order of 50 feet thick. The last phase in the geological history is the Pleistocene glaciation which has left its mark on the area examined in the form of a thin layer of glacial till in the westernmost section of the area.

IV. Acknowledgments.

The field work in the Tarraleah area was carried out in connection with investigations on behalf of the Hydro-Electric Commission of Tasmania, and this summary account of the regional geology of this area is published through the courtesy of the

Commission. I am indebted to Professor S. W. Carey, who spent a considerable time prior to the commencement of the field work in showing me many of the type sections in the country between Hobart and Tarraleah, and who has throughout the course of the work contributed much in the course of discussion in the field. I am grateful to him also for having critically read my manuscript. My thanks are due also to Dr. A. H. Voisey for discussion in the field of the succession exposed in the Marlborough Permian inlier.

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PLATE VII.

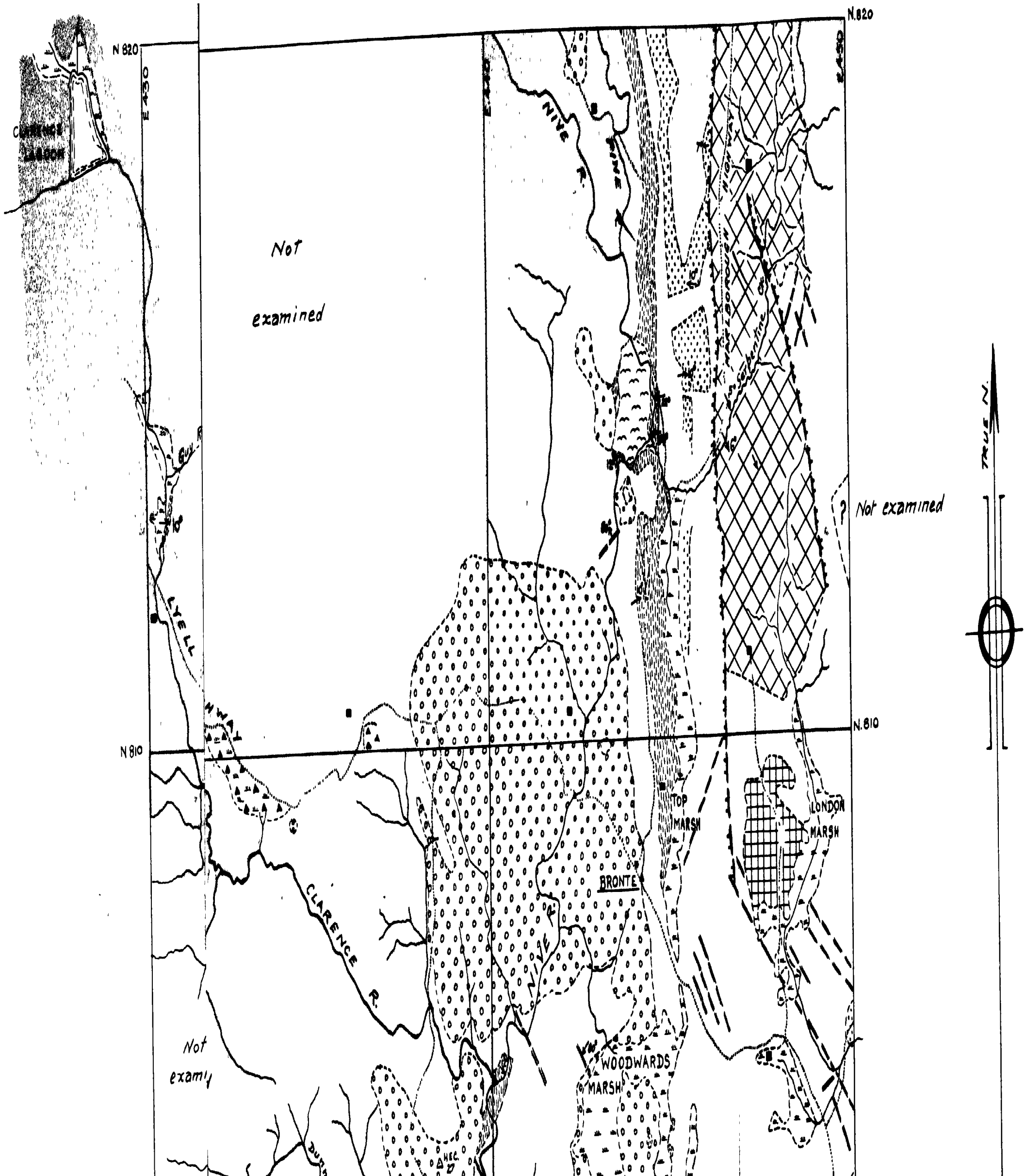
Geological map of the country in the vicinity of Tarraleah. The grid lines on this map are at 10 kilo-yard intervals and refer to the grid on the 4-mile State map of Tasmania published in 1944. The original maps from which this geological map has been made are on a scale of 20 chains to one inch and show considerably more detail than can be shown in this map. These 20-chain maps are the property of, and are filed by, the Hydro-Electric Commission, Hobart.

PLATE VIII.

A. The Nive Valley looking upstream from the Nive Bridge on the Lyell Highway, showing the dolerite hills (in distance) rising above the basaltic areas (foreground and middle distance). The flat topography of the basaltic areas can be clearly seen in the middle distance.

B. The Nive Fault exposed at the junction of Wentworth Creek and the River Nive. View looking south along the strike of the fault. Both walls are of dolerite. Note curvature of fractures on west side of fault and intense brecciation of the dolerite near the fault (in vicinity of hammer).

C. Clark Dam fault exposed in excavation for the eastern abutment of the Clark Dam at Butler's Gorge. This fault zone is in dolerite and is typical of the north-easterly trending shear zones in the dolerite which are indicated on the accompanying geological map. (Plate VII.)



N 820
E 430
Not examined
NIVE R.
Guy R
LYELL HWAY
N 810
CLARENCE R.
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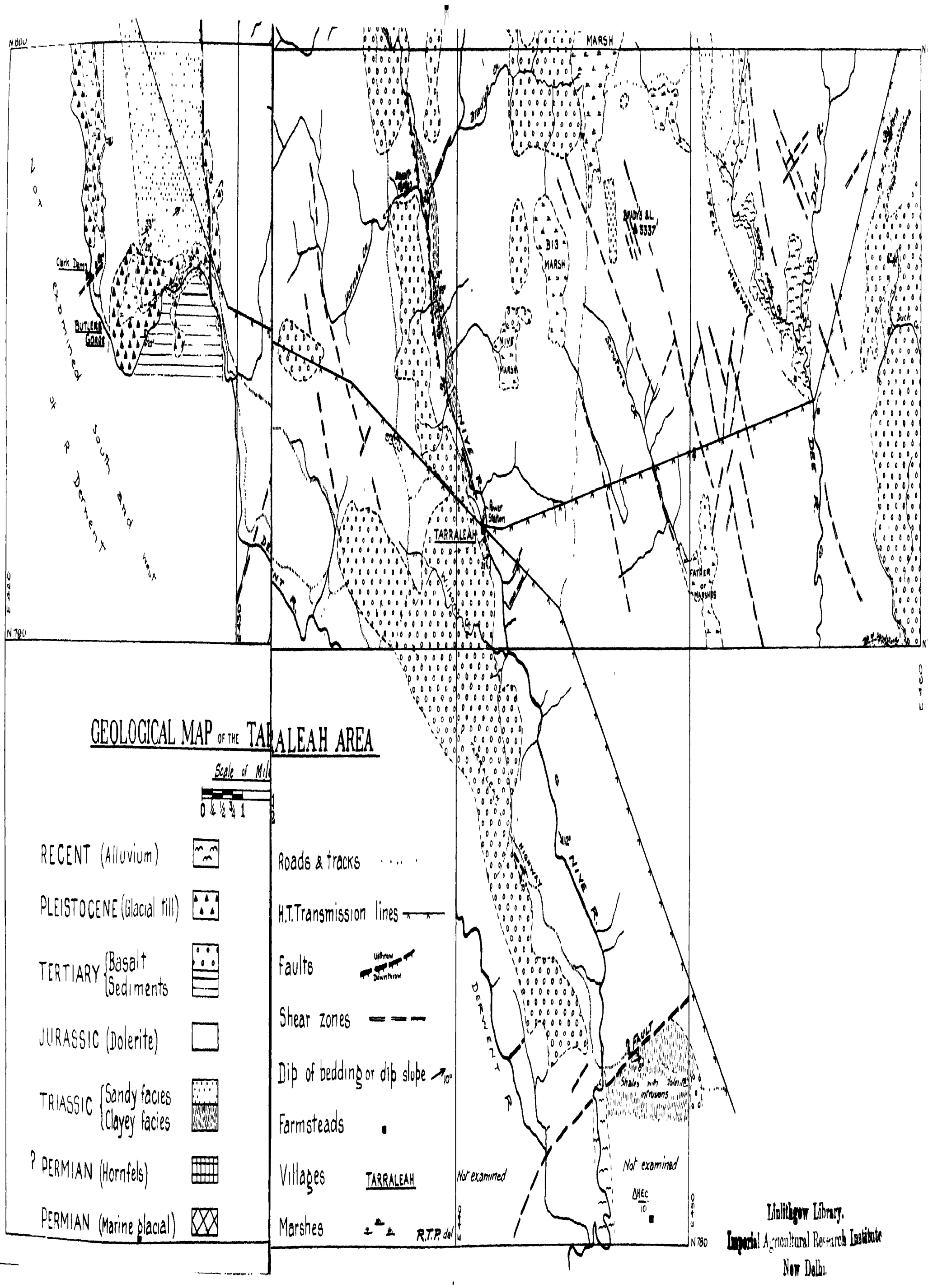
BRONTE
TOP MARSH
LONDON MARSH
WOODWARDS MARSH
BRADYS
Dunnys Ck.
Wentworth Ck.
6°
WENTWORTH HILLS
N.820
Not examined
TRUE N.
N.810


GEOLOGICAL MAP OF THE TARRALEAH AREA
Scale of Miles
0 ¼ ½ ¾ 1
RECENT (Alluvium)
PLEISTOCENE (Glacial fill)
TERTIARY {Basalt Sediments
JURASSIC (Dolerite)
TRIASSIC {Sandy facies Clayey facies
? PERMIAN (Hornfels)
PERMIAN (Marine glacial)
Roads & tracks
H.T. Transmission lines
Faults
Upthrow
Downthrow
Shear zones
Dip of bedding or dip slope
10°
Farmsteads
Villages
TARRALEAH
Marshes
R.T.P. del
Not examined south and west of R. Derwent
Clark Dam
BUTLERS GORGE
MARSH
BIG MARSH
NIVE MARSH
BRADY'S SL. 3337
TARRALEAH
Power Station
FATHER OF MARSHES
NIVE R.
DEE R.
DERWENT R.
FAULT
Shales with dolerite intrusions
Not examined
N 800
N 790
N 780

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PAP. AND PROC. ROY. SOC. TASMANIA, 1947 (1ST AUGUST, 1948)

Boomer Marsh—A Preliminary Botanical and Historical Survey.

By

W. M. CURTIS and J. SOMERVILLE.

During the year 1942, the Tercentenary of the Dutch landing in Tasmania, interest was again aroused in the question of the site of the landings which took place on December 2nd and 3rd, 1642 (old calendar). This question has led to considerable discussion by members of the Royal Society, during which no finality has been reached. Of the various views advanced, J. P. Gell (1845) considered the western shore of Forestier's Peninsula to have been the watering place selected by the Dutch discoverers on December 2nd, 1642. This suggestion was supported by J. B. Walker (1890). G. H. Halligan (1925) and Clive Lord (1926) gave reasons for believing the site to have been the small inlet just within 'The Narrows' on the western shore of Forestier's Peninsula (fig. 1). A. N. Lewis (manuscript in Library of Royal Society of Tasmania) considered Bream Creek to have been 'the spot at which water was obtained on this day'.

In December, 1942, a copy of the Gilsemán chart (1642) was obtained by the Royal Society of Tasmania, and on the chart 'Water Plaats' is clearly marked on the western shore of Blackman's Bay, in a place corresponding to an unnamed opening shown on Tasman's chart. However, it has been argued that the charts do not provide definite evidence of the exact location of the site, for the following reasons:—

1. That Tasman's journal is too vague to serve for a firm basis of opinion.
2. That the name of a place on the chart does not always indicate its exact position.
3. That the charts are inaccurate when compared with present-day coastal topography.

Since, in Tasman's Journal, there is some record of the nature of the vegetation and of the herbs collected for food, the authors made a botanical survey of the localities under discussion. The results suggest the probable place of the landing to have been at Boomer Marsh. It is suggested that the botanical survey may help in the solution of the controversial problem of the site of the original Dutch landing and a preliminary account of the ecology of the area is given. The area is of botanical interest since, except for a description of sand-dunes given by Consett Davis (1940), no account of the coastal vegetation of Tasmania has been published.

The following quotations are taken from Tasman's Journal, 2nd December, 1642: 'About 3 hours before evening our Vessel returned and brought some strange Greens which they saw grow plentifully. Some of them are like to the greens which grow on the Cape of good hope and may be used in place of wormwood. The others are long and saltish and like to Sea Parsley . . . They found high but even land. Greens plentifully, growing naturally and not being planted'. (Woide's translation, Chief Secretary's Office.) 'About 3 hours before evening

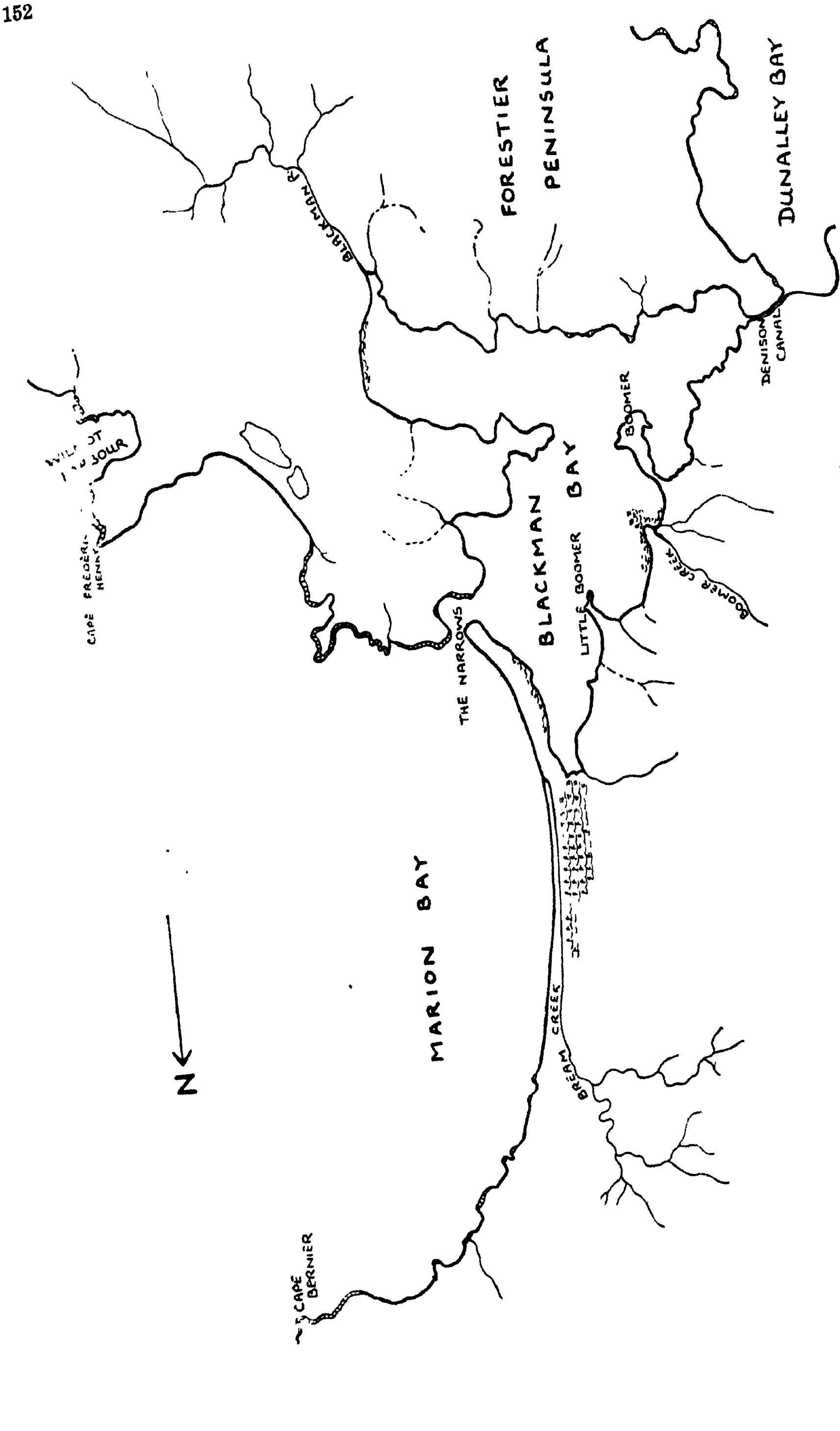

FIG. 1.—Blackman Bay, E. Coast, Tasmania. Scale, 1 inch = 2 miles.

our boats returned bringing various samples of vegetables which they had seen growing in abundance, some not unlike certain herbs which grow at Cabo de Bona Esperance and are fit for use as pot-herbs. Others were long and saltish which have no ill likeness to Sea parsley'. (Swart's edition.)

'About 3 hours before nightfall the boats came back, bringing various samples of vegetables which they had seen growing there in great abundance, some of them in appearance not unlike a certain plant growing at the Cabo de Bona Esperance and fit to be used as pot herbs and another species with long leaves and a brackish taste strongly resembling persil de mer or samphire . . . They had found high but level land covered with vegetation not cultivated but growing naturally by the will of God'. (Heere's Edition.)

In an attempt to locate an area in which 'greens suitable for pot herbs' grow in abundance or, alternatively, an area which showed evidence of having carried such vegetation in the Seventeenth Century, the coast from Wilmot Harbour to Cape Bernier was explored. Appropriate vegetation was found in only three areas, in marshes at the mouth of the Blackman River, at Bream Creek, and at Boomer Creek. The marsh at the Blackman River is young; the vegetation is an open community of *Salicornia*. Bream Creek marsh represents a fresh-water swamp which has become saline since the cutting of drainage channels to carry flood water from Bream Creek. The small saltmarsh at Boomer Creek is apparently in equilibrium with the factors of this habitat. Here, edible herbs are abundant and the topography of the area is in agreement with the description in Tasman's journal.

Boomer Marsh is a saltmarsh some four and a half acres in extent, which lies at the foot of the sandstone bluff about midway between Little Boomer and Boomer, the two prominent peninsulas on the western shore of Blackman's Bay (fig. 1). Boomer Creek (the putative watering place of Tasman) runs on the southern side of the headland known as the Bluff. The ground rises steeply above the marsh to a level area at the summit of the Bluff. A hundred yards to the south of Boomer Creek is another small stream not shown on the earlier maps. The land drained by this stream was originally part of the Hildyard Estate. Mr. C. D. Hildyard, a grandson of the original owner, states that when the grant was first occupied no stream existed and the present watercourse results from channels dug during the early part of this century to drain the swampy land. Extensive silting is exposed at low tide, extending from the mouth of each stream into the bay. While it is difficult to estimate the time involved in such silting, it is worth noting that streams such as the Piper River (N. Coast) which were navigable in the days of the early settlement of Tasmania, would no longer be practicable for the vessels then used.

An outline of the area occupied by the saltmarsh at Boomer was obtained by taking compass bearings and measurements between selected landmarks. A base-line from the creek bank, 65 metres above the mouth, was taken due east over the crest of the sandy spit forming the shore-line, a distance of 413 metres. Perpendiculars to the base-line were taken at intervals of approximately 80 metres: small channels and pans were mapped along the transects and by eye in the intervening regions. Six quadrats were laid down in selected areas along the base line and a census of the plants in each quadrat was made at intervals during the years 1942-1946. The vegetation was then mapped by making notes of the association in each metre along the transects (fig. 2).

This small area of saltmarsh shows a complicated pattern of erosion and deposition, due in part to the double tides which are a feature of Blackman's Bay since the cutting of the Denison Canal in 1902-1903. A sand-spit running in a north-west

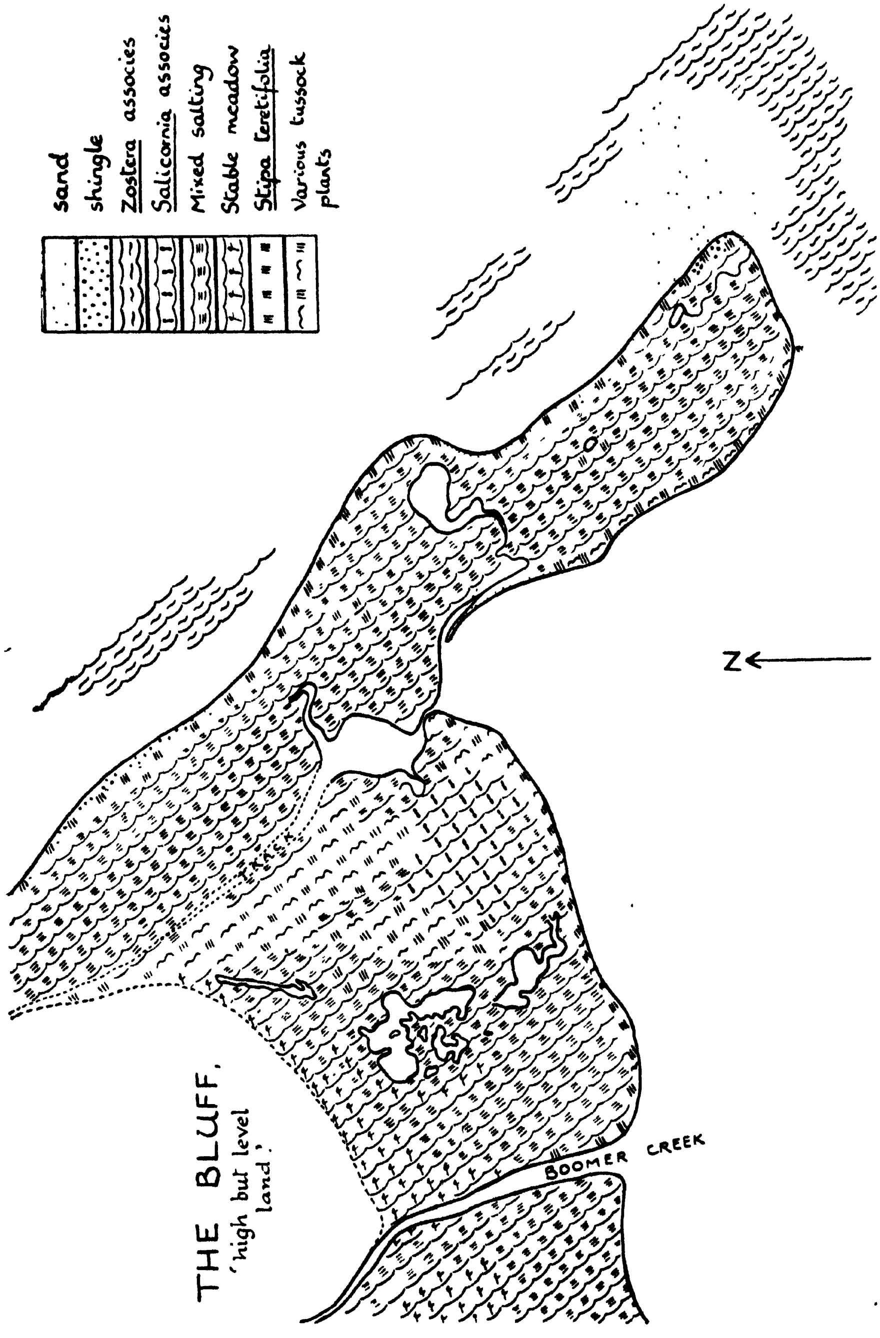

FIG. 2.—Saltmarsh at Boomer Creek. Scale, 1 cm. = 28 metres.

to south-east direction, forms the seaward boundary of the marsh. There is erosion on the south-west bank, but the distal end of the spit is being extended in an easterly direction. Similar erosion and deposition occur at Boomer, Little Boomer, and the Spit at The Narrows. At Boomer Marsh, between the present shore-line and the Bluff are several well-defined ridges of sand and shell representing old shore-lines, some of which can be assumed to have been in existence in 1642. Saltings are developed in the sheltered bays between the old shore-lines in the area between the sand-spit which forms the present shore-line, Boomer Creek, and the Bluff.

In general physiognomy, Boomer Marsh may be compared with the saltmarshes along the east coast of Great Britain, such as that described by Oliver (1913). Floristically, Boomer Marsh is comparable with the saltmarshes of the south-east coast of the Australian mainland, such as the marshes described by Pidgeon (1940) in New South Wales, and by Patton (1942) in Victoria, except that in Tasmania as in Great Britain, *Zostera* and *Salicornia* are pioneer plants on exposed mud and mangroves do not occur.

Boomer Marsh shows considerable variety in the terrain, areas of soft mud and silt, sandy mud, and sand with shell being found. The succession of plants appears to depend largely on the character of the substratum. The saltings, which are grazed by cattle, appear to be relatively stable, but the marsh must be recognised as an area on which, in appropriate conditions, a succession of plant associes could culminate in the development of open eucalyptus forest which is the climax formation.

The following zones may be distinguished:—

1. Algal communities.

On the seaward side of the sand-spit is an extensive area of sand exposed only during low spring tides. This is sparsely covered by *Hormosira*, there being approximately five plants per square metre. Each plant is attached to the shell of a mussel (*Mytilus*, sp.), which is buried several inches below the surface. It is of interest to note that in Tasman's Journal (Heere's Edition) there is a record of finding inside the Narrows, 'different kinds of muscles forming small clusters in several places.'.

2. *Zostera* associes.

The areas occupied by *Zostera muelleri* are not invaded by other flowering plants, but in one region on the south-east side of the spit, *Zostera* is associated with *Lepilaena* sp.

3. The Saltings.

In the lowest parts of the area between the shore and the Bluff there is an open plant community of *Salicornia australis*. At a slightly higher level the Salicornia associes is invaded by *Wilsonia humilis*. The long runners of this plant are very conspicuous, as they spread out for several metres, rooting at the nodes. In a region of soft mud, *Salicornia* is associated with *Triglochin striata*. Where the period of immersion at each high tide is less, *Salicornia australis*, *Samolus repens*, *Hemichroa pentandra*, and *Suaeda maritima* form a closed community. Occasional bushes of *Arthrocnemon arbuscula* and tussocks of *Cladium filum* are scattered throughout the saltings, but the greater number of these plants occur in the higher parts of the marsh.

4. Stable meadow, beyond the limit reached by the high spring tides.

This is a narrow zone at the base of the Bluff, receiving drainage from the high ground. After heavy rain the vegetation may be submerged in brackish water. Plants in this zone include the grasses listed below, among which *Distichlis disticophylla* is particularly conspicuous. Other plants in this closed community are: *Spergularia rubra, Apium australe, Brachycome graminea, Selliera radicans, Lobelia anceps, Sebaea albidiflora, Plantago coronopus, Hemichroa pentandra. Salicornia australis,* is scattered throughout. The following species form tussocks: *Juncus maritimus, Scirpus nodosus, Cladium filum* and the grasses *Stipa teretifolia* and *Poa caespitosa.*

5. Ridges of sand and shell.

This stable ground, rarely covered by the highest tides, carries scattered bushes of *Arthrocnemon arbuscula* and tussocks of *Cladium filum* and *Stipa teretifolia,* also occasional clumps of *Gahnia trifida.* A few plants of *Plagianthus spicatus* occur, but they are heavily grazed. *Salicornia Blackiana* is scattered over these higher areas. The glaucous appearance of this plant distinguishes it from the more abundant *S. australis.* Plants which are found on the lower parts of the ridges, for example, *Selliera radicans, Wilsonia Backhousii* and *Apium australe* grow luxuriantly at the bases of the tussocks.

6. Pans and Creeks.

A number of pans have clearly originated by the blocking of drainage channels, some of those which are filling up carry a sparse cover of *Salicornia australis* as well as free-floating forms of green and red algae. A long deep pan in the higher part of the saltings contains the submerged phanerogams *Ruppia maritima* and *Lepilaena Preissii.* In Boomer Creek the floating leaves of *Zostera Muelleri* are conspicuous: luxuriant clumps of *Apium australe* occur along the banks.

Boomer Marsh corresponds in position to the 'Water Plaats' marked on the Gilseman chart. The saltings which exist in the bays between old shore-lines provide a variety and abundance of plants long familiar as pot herbs. *Salicornia* is still collected as 'samphire' from the salt marshes on the east coast of England. Gell (l.c.) writes of the Dutch discoveries: 'They collected a quantity of greens which were in all probability the Canagong *(Mesembryanthemum aequilaterale)* of the aborigines, long and of saltish taste'. At Boomer Marsh only one plant of *Mesembryanthemum* was found, but *Hemichroa pentandra,* which is plentiful is not dissimilar in the vegetative state. Species of *Mesembryanthemum* were familiar to sailors of the Seventeenth Century: of the many species in South Africa, *M. pomeridianum* L. from the coast at the Cape, was gathered for eating (for this information we are indebted to Miss E. Stephens of the Botany Dept., University of Cape Town). It is conceivable that at Boomer, *Mesembryanthemum* was previously more abundant, as it is now on the salt marshes at George's Bay (E. Coast), or that *Hemichroa* could be the plant 'not unlike a certain plant growing at the Cabo de Bona Esperance'. However, the description in Tasman's Journal (Swart's Edition) of plants 'which have no ill likeness to Sea parsley' suggests *Apium australe,* a plant abundant in this area.

CONCLUSION

The botanical evidence presented in this paper supports the contention that Boomer Creek was the site of the Dutch watering place on 2nd December, 1642.

Its position agrees with the unnamed opening on Tasman's chart and with the 'Water Plaats' marked on the Gilseman chart.

List of the Flowering Plants at Boomer Marsh.

Caryophyllaceae	*Spergularia rubra* Pers. *var. marina.*
Malvaceae	*Plagianthus spicatus* B.
Aizoaceae	*Mesembryanthemum australe* Sol.
Umbelliferae	*Apium australe* Hk.
Compositae	*Brachycome graminea* F.v.M.
Goodeniaceae	*Selliera radicans* Cav.
Campanulaceae	*Lobelia anceps* D.C.
Primulaceae	*Samolus repens* Pers.
Gentianaceae	*Sebaea albidiflora* F.v.M.
Convolvulaceae	*Wilsonia humilis* R.Br.
	W. Backhousii Hk.
Plantaginaceae	*Plantago coronopus* L.
Chenopodiaceae	*Chenopodium glaucum* L. *var littorale.*
	Suaeda maritima Dumort.
	Salicornia australis Sol.
	S. Blackiana Ulb.
	Arthrocnemon arbuscula R.Br. (Moq.)
Amarantaceae	*Hemichroa pentandra* R.Br.
Juncaceae	*Juncus maritimus* Lam.
Juncaginaceae	*Triglochin striata* Ruiz. et Pav.
Potamogetonaceae	*Ruppia maritima* L.
	Zostera Muelleri Irm.
	Lepilaena Preissii F.v.M.
	Lepilaena sp.
Cyperaceae	*Scirpus nodosus* Rottb.
	Cladium filum R.Br.
	Gahnia trifida Lab.
Gramineae	*Stipa teretifolia* Steud.
	Dichelachne crinita Hk.f.
	Agrostis stolonifera L.
	A. Billardieri R.Br.
	Distichlis disticophylla (Labill) Fassett
	Poa caespitosa Forst.
	Puccinellia stricta (Hk.f.) Blom.
	Vulpia megalura (Nutt) Rydb.
	Parapholis incurvis (L) C. E. Hubbard.

We are indebted to Mr. C. E. Hubbard, of the Royal Botanic Gardens, Kew, for the identification of the grasses.

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The Royal Society of Tasmania
1947

Patron:
His Majesty the King.

President:
His Excellency Admiral Sir Hugh Binney, K.C.B., D.S.O.

Vice-Presidents:
L. Cerutty, B.A., Dip.Ed., 1947.
W. H. Hudspeth, B.A., 1947, 1948.

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S. W. Carey, D.Sc., 1947, 1948, 1949
W L. Crowther, D.S.O., M.B., 1947.
V. V. Hickman, B.A., D.Sc., 1947, 1948.
L. W. Miller, M.Agr.Sc., F.R.E.S., 1947, 1948, 1949.
J. L. Somerville, M.Sc., F.A.C.I, 1947, 1948
J. W. C. Wyett, B.Sc., A.A.C.I., 1947.

Hon. Secretary and Librarian:
Joseph Pearson, D.Sc. (Manchester), D.Sc. (Liverpool), F.R.S.E., F.L.S.

Assistant Hon. Secretary:
D. C. Pearse, M.C.

Hon. Treasurer:
S. Angel.

Hon. Auditor:
H. J. Exley, M.A.

Hon. Editors of the Papers and Proceedings:
Joseph Pearson.
D. C. Pearse.

Standing Committee:
W. L. Crowther, V. V. Hickman, W. H. Hudspeth, J. Pearson.

Annual Report, 1947

The Annual Meeting was held in the Society's Room, Tasmanian Museum and Art Gallery, Hobart, on the 27th February, 1947.

His Excellency the Governor, President of the Society, presided.

The following Office-bearers were elected:—

Vice-President: Under the Society's Rules, Mr. Henry Allport retired from the office of Vice-President, and Mr. W. H. Hudspeth was appointed in his place (retiring 1949).

Hon. Secretary and Librarian: Dr. Joseph Pearson.

Hon. Assistant Secretary: Mr. D. C. Pearse.

Hon. Treasurer: Mr. S. Angel.

Hon. Auditor: Mr. H. J. Exley.

Council: Under the Rules Mr. A. L. Meston and Mr. R. G. Brett retired from the Council and the following members were elected to the Council in their places:—

Professor S. W. Carey (retiring 1950).

Mr. L. W. Miller (retiring 1950).

Also one member was required to take the place of Mr. W. H. Hudspeth, who was elected Vice-President, and Mr. J. L. Somerville was elected for two years. As Dr. Gordon was leaving Tasmania, Mr. J. W. C. Wyett was elected for the remaining one year of Dr. Gordon's period of office. The names of the full Council for 1947 are given on the previous page.

The Council made the following appointments at its first meeting:—

Assistant Librarian: Miss H. Taylor.

Standing Committee: Dr. W. L. Crowther, Professor V. V. Hickman, Mr. W. H. Hudspeth, and the Hon. Secretary.

The Council elected the following two members of the Society to serve on the Board of Trustees of the Tasmanian Museum and Botanical Gardens:—Professor V. V. Hickman and Mr. W. H. Hudspeth.

Nine ordinary meetings and one special meeting were held during the year (see Proceedings for abstracts of papers). In addition scientific papers were submitted for publication and have been printed in the present volume.

Library

During the year 780 volumes (this number includes the Clive Lord Memorial volumes which had not previously been entered in the accession book) were added to the Library in addition to a number of reports and pamphlets from British and foreign institutions and learned societies. The number of institutions on the Exchange List for the year was 291, and new exchanges were arranged with the following institutions:—The British Council, London; New England University College, Armidale, University of Sydney; New Zealand Department of Agriculture; Studia Botanica Cechoslovaca, Prague; University of New Mexico; Facultad de Agronomia y Veterinaria, Buenos Aires; Uniwersytet Marii Curie-Sktodowskiej, Poland. The Library now consists of 22,165 volumes.

Cataloguing the Library

During the year Miss M. Griffiths, B.A., Cataloguer from the University of Tasmania's Library, commenced work on cataloguing the Society's Library and classifying it under the Dewey System of Classification. This arrangement was made with the University on condition that in return for Miss Griffiths' services, a duplicate author catalogue should be made available to the University Library.

Membership

The Society consists of the following members:—

Honorary members		2
Corresponding members		2
Ordinary members—		
Class A.	176	
Class B.	116	
	—	292
Life members		16
Associate members		19
		—
		331

During the year 15 names were removed from the list of Members owing to deaths, resignations, etc., and 27 new members were elected, one of these being a life member, 21 ordinary members, and five associate members. (Also one ordinary member became a life member.)

Deaths

The Council regrets having to record the deaths of the following members during the year:—Mr. H. Amos (1944), Mr. F. L. Brownell (1907), Mr. T. A. Gepp (1942), Mr. E. H. Kirby (1927), Mr. E. L. Piesse (1902), Dr. A. Jefferis Turner (1927), and Mr. E. H. Webster (1930).

Edmund Leolin Piesse, LL.B., B.Sc., will be remembered by senior members as Honorary Secretary to the Society during 1913-14, at a time when its fortunes were at a very low ebb.

Mr. Piesse, thorough and systematic in method, during his term of office prepared an authentic paper on 'The Foundation and Early Work of the Society, with some Account of other Institutions of Early Hobart' (Papers and Proceedings of the Royal Society of Tasmania, 1913), and commenced the cataloguing of the Library.

At the outbreak of the 1914-18 War he was in practice as a solicitor in Hobart, but in 1916 he left to serve in the Intelligence Branch of the Commonwealth Defence Department at Melbourne. Leaving the army, Mr. Piesse joined the Prime Minister's Department in which he became, eventually, Director of the Pacific Branch.

It was his custom to come to Tasmania occasionally for a summer vacation, but, as the Royal Society was not in session at those seasons, he made contact with only a few of his old friends. Nevertheless, he retained his membership until the end and his services to the Society will be gratefully remembered.

Alteration of Rules

A special meeting of the Society was called on 5th August, 1947, in order to consider certain alterations to the Rules. Details regarding these alterations are given in the Abstract of Proceedings (p. 169).

Financial Position of the Society

For some years the Council of the Society has been greatly concerned about the Society's financial standing. As time has passed expenses have increased and the income has remained more or less stationary. This problem was solved to some extent by the increase of the subscription of ordinary members which came into force in the year 1945. However, this relief proved to be only temporary and the time has come for the Society to take stock of its position. The Society's income from all sources is about £450 and the whole of this money is expended on essential services but there is no margin for paying an adequate salary to the Assistant Librarian or for making provision for a second assistant. It is necessary, too, that provision should be made for the purchase of an adequate number of text books and journals. The cost of publishing the Papers and Proceedings has increased considerably with the passing of years and although the Government has been good enough to increase their grant to £200 a year this sum has proved to be inadequate to meet the cost of printing the journal. During the year under review the financial position of the Society has been examined very carefully by the Council. It was felt that the time had come when the State Government should be asked for financial assistance and it was decided to seek the advice of the Chief Justice, the Hon. Sir John Morris. Accordingly the Hon. Secretary was instructed to arrange a meeting with the Chief Justice in order to discuss this question and a conference took place on the 11th July, 1947. The Hon. Secretary placed before Sir John Morris the financial problem and it was then pointed out that the Society and its Library had exerted a considerable influence on the life of Tasmania during the last one hundred years. As a result of this conference it was decided to approach the Government for a grant of £750 per annum in order to enable the Society to maintain services which it had given to the community. In return for such financial assistance the Society might be prepared to offer certain privileges and concessions to special groups of people who were not members of the Society but who were serious students of some branch of literature or science. The Chief Justice offered to accompany the Hon. Secretary to discuss this matter with the Premier. Accordingly a meeting took place on 18th September, 1947, in the Chief Justice's Chambers. Previously the Hon. Secretary had drawn up a memorandum which was presented both to the Chief Justice and the Premier and this memorandum formed the basis of the discussion which took place at that meeting. The Premier expressed sympathy with the desire of the Society to obtain adequate financial support in order to carry out its programme of work, but he stated that it was then too late to include any provision in the budget for the financial year 1947-48, but that consideration of the matter might be made during the next financial year. The Premier added, however, that he saw no reason why the Society should bear any part of the cost of producing the Papers and Proceedings and as a direct outcome of this discussion a letter was received from the Premier on 13th October, 1947, in which the State contribution to the cost of printing the Society's journal was increased from £200 to £300 per annum.

Meeting with the Northern Branch

On the 22nd August, 1947, a conference was held between the Council of the Royal Society of Tasmania and representatives of the Northern Branch of the Society. The meeting was held in the Society's room at the Tasmanian Museum.

Eight members of the Council and four representatives of the Northern Branch were present. Amongst the matters discussed at this meeting were the following:—

(*a*) Definition of Northern Branch membership.

(*b*) The proportion of Northern Branch subscriptions to be returned to the Branch.

(*c*) The right of the Northern Branch to administer any property bequeathed to it.

Acting upon the feeling of this special meeting the Council had a meeting on the 3rd September, 1947, and decided upon the following definition of membership of the Northern Branch, namely:—

'Any member nominated and elected by the Northern Branch shall be recognized as a member of that Branch irrespective of his place of residence.'.

It was further agreed that in future the present number of members who were attached to the Northern Branch, namely 32, should be regarded as the basic number and that in respect of this number of members the Northern Branch should receive one-third of the subscriptions of such members as appear in this 'Basic list' and that in respect of all such members over and above this basic number ('Subsidiary list') the Northern Branch should receive the following proportions of subscriptions:—

£1 10s. members—17s. 6d.

£1 1s. members—15s.

It was to be understood, however, that the basic number should be maintained at 32 and that any vacancies which occurred in the basic list should be filled by transfers from the subsidiary list.

With regard to the responsibility of the Society's Council regarding any property bequeathed to the Northern Branch it was decided that—

(1) The terms of any bequest made to the Northern Branch would be strictly observed by the Council.

(2) Any property acquired by the branch should remain in its custody during the existence of the Branch.

(3) In the event of the Branch ceasing to exist, the Council would hold all such property referred to under (1) and (2) in trust until such time as the Northern Branch would be re-established.

(4) The rights of the Queen Victoria Museum in any property held jointly by the Museum and the Branch to be recognized.

Appointment of Government Archivist

During the year the Council appointed Dr. W. L. Crowther, Mr. W. H. Hudspeth, and Mr. A. L. Meston to meet the Chief Secretary in order to discuss with him the appointment of a fully qualified archivist. In due course the deputation met the Minister who promised that before an archivist was appointed the members of the deputation would be consulted regarding the suitability of candidates.

Dr. George Mackaness—Franklin Brochure

During the year Dr. Mackaness published his brochure on Lady Franklin based upon certain letters which are the property of the Society and, in accordance with an agreement already entered into, one hundred copies of the brochure were acquired by the Society at cost price and will be available to members who wish to purchase them.

Clive Lord Memorial Lecture

The Clive Lord Memorial Lecture was delivered by Dr. Harold Thompson on 'Fish Welfare', on 11th November, 1947, and he was presented with the Clive Lord Memorial Medal. After the lecture a conversazione was held. At that meeting Dr. J. C. Jaegar was presented with the Lyle Memorial Medal on behalf of the Australian National Research Council.

Knopwood Diaries

(*a*) During the year the Society acquired from the Mitchell Library microfilms of the Knopwood Diaries, 1814-1838, consisting of eight volumes (1600 pages).

(*b*) The last 90 pages of Knopwood's Diary made on board H.M.S. Resolution and H.M.S. Calcutta, 1801-1803, making a total of 1690 pages in all.

Enlarged photographic prints from these microfilms are being made by the Government Photographic Department and one complete set is being presented to the Society's Library by the State Government. The second complete set will be printed for the use of the State Government.

Nevin Hurst Papers

The Council has to report the acquisition of a valuable set of papers which had been brought together by the late Nevin Hurst, I.S.O., formerly Secretary for Lands. These papers throw light upon contemporary history of Tasmania and the gift was made possible through the generosity of Mr. Hurst's widow. During the year Mr. W. H. Hudspeth very kindly compiled a list of contents of these papers.

A. N. Lewis Memorial Fund

After the death of Dr. A. N. Lewis in 1943 a number of friends subscribed a sum of £414 2s. 8d. It was decided to utilize this money:—

(*a*) To publish Dr. Lewis' paper on 'The Geology of the Hobart District'.
(*b*) The residue to be handed to the Royal Society of Tasmania to establish a memorial in the Society's Library.

During the year under review a sum of £232 17s. 11d. was handed to the Council of the Royal Society by the A. N. Lewis Memorial Committee under the following conditions:—

'The net money remaining after having paid the charges and all incidental expenses incurred by the Committee, shall be used to establish a Fund which will be handed to the Council of the Royal Society of Tasmania to administer. This Fund shall be held in trust by the Council and the interest arising from the investment of the Fund shall be used by the Council to purchase geological and other scientific books for the Society's Library. Each book so purchased to have a special book plate showing that the book is part of the A. N. Lewis Memorial Library.'.

It was agreed to accept this sum on the above stipulations and accordingly a sum of £200 has been invested in the new security loan and the balance of £32 17s. 11d. has been placed in the Hobart Savings Bank.

Additional Chairs

During the year twenty new chairs were acquired for the Society's room, half being presented by the Trustees of the Tasmanian Museum and the cost of the remainder was met from the Society's funds.

Gifts to the Society

The following is a list of gifts to the Society during the present year in addition to the numerous exchanges received from British and foreign institutions:—

Nevin Hurst papers (already recorded).

Professor L. F. Giblin—40 copies of Papers and Proceedings, several catalogues and reports of the Royal Society, and seven books.

Mrs. C. N. Atkins—Swanston and Derwent Bank Letter Books—
Three Swanston Letter Books, 1831-1847.
Three Derwent Bank Letter Books, 1829-1854.

Mr. J. A. V. Denny—Society of Chemical Industry Journal, 1946 numbers; Chemical Society Journal, 1946 numbers; and British Abstracts, 1946 numbers.

Dr. P. A. Maplestone—58 medical books.

Mr. E. Rodway—19 books (formerly the property of the late E. Rodway).

Miss V. Mace (through Mrs. W. H. Hudspeth)—The Colonial Magazine, 1840, and The Penny Magazine, 1832.

Hobart City Council—City of Hobart Plan.

Gifts were also received from Miss G. Adams, Miss M. G. Rouse, and Miss G. Mitchell.

Printing of Papers and Proceedings

Mention has been made of the State Government's very generous contribution towards the printing of the Papers and Proceedings. The Council wishes to record its appreciation of this assistance.

Abstracts of Proceedings

27TH FEBRUARY, 1947

Annual Meeting

The Annual Meeting was held in the Society's Room, Tasmanian Museum. His Excellency the Governor, President of the Society, presided.

The following Office-bearers were elected for 1947:—Mr. W. H. Hudspeth was elected Vice-President for two years in the place of Mr. Henry Allport, who retired under Rule 12; Honorary Secretary, Dr. J. Pearson; Assistant Honorary Secretary, Mr. D. C. Pearse; Honorary Treasurer, Mr. S. Angel; Honorary Auditor, Mr. H. J. Exley.

The following were elected members of the Council for 1947:—Professor S. W. Carey and Mr. L. W. Miller were elected for three years in place of Mr. A. L. Meston and Mr. R. G. Brett, who retired under Rule 21; Mr. J. L. Somerville was elected in place of Mr. W. H. Hudspeth, who had been elected Vice-President, for the remaining two years of his office and Mr. J. W. C. Wyett was elected to take the place of Dr. H. D. Gordon, who was leaving Tasmania, for the remaining one year of his office.

The following were elected members of the Society:—Mrs. Winifred P. H. Radford, Mr. Paul Radford, Mr. M. C. Russell.

Dr. R. W. Fairbridge delivered an illustrated lecture dealing with 'Some Aspects of Structural Geology', of which the following is an abstract:—

Geological thought and method have evolved during the last 100 years, gradually and without revolutionary jumps, beyond the initial stage of the simple geological survey, the recording of facts relating to the composition of the rocks of the countryside and the mapping of these components to show a real distribution. More advanced studies are now possible, relating not only to the evolution of life, by means of fossils, but also to the analysis of sediments and igneous rocks by means of the microscope and other instruments.

But in addition to all this, a new science has grown up, that of structural geology—the study of rock forms, the shapes into which these rocks may be deformed during earth movements. Transferred onto a world-wide scale this is known as 'Geotectonics'. Structural geology is now used to unravel the secrets of ore deposition and of petroleum development, while geotectonic methods are used for predicting new fields for search.

It may be demonstrated, for example, how the distribution of oil-fields follows certain geotectonic belts, which have undergone a highly complex palaeogeographic evolution. Australia's geotectonic position lies outside the major belts, but there are certain restricted areas (about 5 per cent of the total) which would be foolish to ignore. Hitherto, there has been very little systematic mapping or research in this direction, but the formation of the initial nucleus of a federal geological survey in Canberra is a step in the right direction.

Australia needs a central geological survey and research agency as much as any country, young or old. It is last in the field in this respect and has a great deal of leeway to make up. The personnel of such a body should number not a handful, but hundreds or even thousands, when one considers the great need for reliable information about the rocks of this country for all sorts of developmental purposes, such as new land settlement, soil survey, main roads planning, railway construction, aerodrome building, artesian water supply, dam construction, water power, irrigation, not to mention all sorts of mineral resources from coal to oil and uranium.

1ST APRIL, 1947

A meeting was held in the Society's Room. Mr. W. H. Hudspeth, Vice-President, presided.

The following were elected members of the Society:—Mrs. G. R. Garner, Miss J. M. Turner, Miss J. Waterhouse, Mr. M. R. Banks, Mr. F. R. Dowse, Mr. T. D. Hughes.

Dr. H. E. Dadswell of the C.S.I.R. Division of Forest Products delivered an illustrated lecture entitled 'Forest Products Research', of which the following is an abstract:—

The first Australian forest products laboratory was established in 1919 in Perth, by the Institute of Science and Industry, under Mr. I. H. Boas, but this did not last long owing to the lack of funds, although work on the pulping of Australian timbers was carried on in Perth and later in Melbourne. This work formed the foundation of the Australian Pulp and Paper Industry of to-day.

In 1928 the newly constituted C.S.I.R. decided to form as one of its activities the Division of Forest Products with Mr. I. H. Boas as it first Chief. From that time the Division has grown and now has approximately 200 members on the staff.

During the war years the use of timber increased enormously and the need for knowledge of its properties, behaviour, etc., was urgent. To meet this demand the Laboratory had to be developed rapidly, and to-day there is a very great need for more fundamental research.

The organization of the Division is such that the various problems of forest products can be tackled in eight main fields:—Wood structure, wood chemistry, timber physics, timber mechanics, timber preservation, timber seasoning, veneer and gluing, and utilization dealing with applied aspects. As regards the work of the Section of Wood Structure, which is my own section, we endeavour to follow several main lines of investigation, including the structure of the cell, the study of wood anatomy in general, the influence of structure on properties. and the influence of growing conditions on structure.

The question of utilization of the material from the forest is of the greatest importance and new methods are constantly being investigated especially as regards the waste, sawdust and shavings, that are burnt every day.

The plastic industry is always on the lookout for wood-flour as a filler and up to the present that from softwoods is preferred. Sawdust can also be used in mixtures with cement with and without sand and the slabs or blocks so made have a definite value.

The Division in co-operation with the C S I R. Building Materials Section is developing this line of work.

The University of Tasmania and certain other Australian universities have become interested in fields of forest products research and have trained workers in such fields. The goal is the complete utilization of the forest tree. one way of obtaining this close utilization is by co-operation of industries, the waste from one series of operations becomes the raw material for another. Tasmania seems ideally suited for forest products industries. It has available considerable hardwood forests and ample power with plenty of good water. Replanting of cut-over areas is necessary to maintain adequate supplies of raw material.

6TH MAY, 1947

A meeting was held in the Society's Room. Mr. L. Cerutty, Vice-President, presided.

Mr. W. Hudson was elected a member of the Society.

Mr. W. H. Hudspeth delivered an illustrated lecture entitled 'Leaves from the Diary of a Van Diemen's Land Official' which was published in full in the Papers and Proceedings for 1946.

3RD JUNE, 1947

A meeting was held in the Society's Room. Mr. W. H. Hudspeth, Vice-President, presided.

The following were elected members of the Society:—Mr. J. M. Boyes, Mr. G. R. Brettingham-Moore, Mr. L. K. Griffiths, Mr. G. C. Wade.

Mr. P. Radford delivered an illustrated lecture entitled 'An Introduction to Coleoptera'.

1ST JULY, 1947

A meeting was held in the Society's Room. Mr. L. Cerutty, Vice-President, presided.

Miss M. Balchen was elected a member of the Society.

Dr. J. Pearson showed aerial photographs which were lent by Mr. C. E. Radcliff, who had received them from Group Captain Courtney, Commanding

Officer at Point Cook, R.A.A.F. Station. The photographs were taken by R.A.A.F. personnel during the recent visit which was paid to Macquarie Island by R.A.A.F. planes.

The Honorary Secretary announced that the Government had agreed to make two sets of photographic prints of the Knopwood Diaries in the possession of the Mitchell Library, Sydney, the Government to retain one copy for the Government archives and to present the other copy to the Royal Society of Tasmania for the use of research students.

Dr. E. K. Emmery delivered a lecture on 'Austrian Child Art', which was illustrated by drawings and paintings done by the children. The following is an abstract of the lecture:—

Most adults can't draw, i.e., they are completely unable of recording any visual impression on paper. What most adults call drawing is only a very primitive form of hieroglyphic writing: a circle represents a head, several straight lines indicate the relative positions of arms and legs.

Children begin to draw in exactly the same way but very soon their vivid imagination as well as their keen sense of observation urges them on to express what is going on in their minds. The Austrians Czizek, Thetter, Dworschak and others have proved, I think conclusively, by their results, that it is fatal for the teacher to interfere at this stage. The teacher as an adult has reached quite a different stage of development, and his advice, or worse still, his corrections have a disheartening, stifling effect on the child. It can only learn by trial and error.

The collection of Child Drawings and Paintings displayed in this room gives a true representation of the work done at an Austrian orphanage in the outskirts of Vienna. It is of special interest because the teacher, Herr Dworschak, has no opportunity of selecting his pupils. They come from the poorest strata of society, and—owing to the lack of funds—live under appalingly poor conditions.

Herr Dworschak maintains that he has never yet met a child that does not like to work. They all like to express their ideas if given the opportunity. Herr Dworschak provides them with paper, pencils, coloured chalks, paints, wood, clay, glass, copper, metal, and allows them to do anything they like. The first results are absolutely bewildering, and yet the teacher does not attempt to graft his own superior knowledge on to the child's mind, he only helps them by suggesting a few simple experiments. These must be as simple as possible to give every single child a chance.

In one lesson he told the children to cover a white sheet of paper with dots. Some children put all the dots into one corner, others spread them out evenly. He asked them: What figures do these dots suggest? Is not our sky covered with similar dots called stars? Immediately the children's imagination began to work.

Later on the same method was applied to the teaching of painting. The children took a damp sheet of paper, and then painted on it with a brush, first in one colour, then two or or three colours together. The colours spread into all possible shades of dark and light, they ran into each other and produced new interesting tints. Again each child was left to make its own discoveries.

Herr Dworschak once asked them to paint a landscape in blue only, and to look at it for a long time. They were asked what it would feel like to walk in such a landscape, and they all agreed that they would have to walk slowly, it was so peaceful and quiet. One child suggested that modest people would like it. Red, on the other hand, is the colour of blood, passion, anger, fire. It gives warmth and movement, it predominates wherever it appears. Yellow is the sunlight, it cannot be caught, has no strength and no limits. Herr Dworschak knows many experiments with complimentary colours, which interest and amuse the class, and also give them an insight into the 'moral' or 'emotional' value of the different colours.

Another experiment: The teacher draws a mountain or a figure in the left bottom corner of the blackboard. The the children are asked to draw a cloud in the opposite space. Some draw it quite small, some big, but they soon discover that there is a certain relationship between the two, they learn to find the right proportion. You will see from the display of children's paintings how quickly they acquire a perfect sense of harmony and balance.

Later, when they are taught to paint letters with a brush, Herr Dworschak points out to them that in their scribbles there is 'a constant war on' between the black script and the white paper. Whenever there is a large black blot or a white 'hole', the peace is lost. But if black and white are nicely balanced the battle is won, and harmony is restored.

What makes these paintings interesting is their originality. You see children in poor homes wearing their shabby wintercoats indoors, because it is very cold without a fire, and worse still, the washing is hanging from the line inside their one little room. In another picture you can see the people go to church on a Sunday. The church is quite small, and the people very large, but alas, their characters are unmistakably portrayed in their faces: some are proud and selfrighteous, others humble and devout. In a third picture we see a house on fire, but somehow the house is alive, pale, trembling, and the fire is personified, it approaches the house barking at it like a fierce dog. There are many other pictures of 'fire', glorious symphonies of colour: red, orange, purple, crimson.

Colour implies feeling. Shape in wood or clay expresses will power and force. It is not surprising that different children prefer different materials. Clay helps the imagination. You can alter and modify it, it grows under your hands. Wood needs purpose, a definite preconceived idea. Only older children can attempt to deal with it successfully, often with astounding results. The same applies to metal and copper work.

In playing ball and other games the child performs feats of agility, which arouse in him a great joy at his own prowess; it is the same when he achieves something in colour, on wood, metal, or any other substance. He takes up something which attracts his attention. His curiosity is not satisfied until he can create something new, but only after long trying does he achieve something that pleases him, that stimulates him to further efforts. As in playing ball it is only by continual practice that the child becomes expert in throwing and catching, so it is with the use of the materials offered him.

Though the teacher observes closely what the children are doing he says no word during their performances. They see in him a comrade, and an appreciative one to boot. One effort leads to another till at last the children have such joy in doing things that their joy is infectious. For their work is really joy bringing, not only to themselves but also to those to whom they can show and give their work There can be no question of discovering future artists at that early age. When they leave school their minds will turn to other matters but the pleasure will remain. It may be that some particular talent will be discovered, but much more important at that age is the fact that the children discover themselves, and all the hidden faculties of thought, feeling, and expression, of which the human mind is capable.

5TH AUGUST, 1947

A special meeting was held in the Society's Room. Mr. W. H. Hudspeth, Vice-President, presided.

Rule 21 was amended to read as follows:—

Each member of the Council other than office-bearers shall be elected for a period of three years. Two members of the Council shall retire annually and shall not be eligible for re-election to the Council for at least one year, but shall be eligible for election as office-bearers of the Society. But a member who has been elected to fill a casual vacancy on the Council for a period of less than three years may be re-elected to the Council for a further term upon the expiry of his original appointment.

Rule 26 was amended to read as follows.—

The Standing Committee shall, subject to any direction given by the Council:—

(i) Ensure that all papers and communications offered to the Society are examined and reported on by a competent authority; and decide whether they shall be printed.

(ii) Arrange for the editing of the Society's Papers and Proceedings and for the printing and publication thereof.

(iii) Arrange the programme of meetings, lectures, and other activities for the year.

(iv) Purchase books for the Society's Library.

(v) Prepare the annual and other reports to be submitted by the Council of the Society.

(vi) Report to the Council on any other matter submitted by the Council to the Standing Committee.

5TH AUGUST, 1947

A meeting was held in the Society's Room. Mr. W. H. Hudspeth, Vice-President, presided.

The following were elected members of the Society:—Mr. J. H. Buckley, Dr. J. L. Grove, Dr. W. V. Teniswood.

Professor V. V. Hickman delivered an illustrated lecture entitled 'The Life of the Crayfish', of which the following is an abstract:—

The marine crayfish, *Jasus lalandii* (Milne Edwards) belongs to the family Palinuridae. It was originally named *Palinurus lalandii* by Lamark and described by Milne Edwards from a South African specimen in 1837. Ortmann in 1891 transferred it to the genus *Jasus*. Members of this genus lack the stridulating apparatus which is possessed by members of the genus *Palinurus*.

Jasus lalandii occurs mainly in a zone between 30 degrees and 45 degrees south latitude and has been recorded from Juan Fernandez, New Zealand, Tasmania, parts of the south coast of the mainland of Australia, St. Paul Island, South Africa, and Tristan da Cunha. Other members of the Palinuridae occur round the Australian coast. For example *Jasus verreauxi* (Milne Edwards) is found off the coast of New South Wales and occasionally in Tasmanian waters; the Coral Crayfishes, *Panulirus ornatus* (Fabr.), *Panulirus penicillatus* (Olivier), and *Panulirus versicolor* (Latreille) occur in the warmer waters round the north of Australia, whilst *Panulirus longipes* (Milne Edwards) is taken in considerable numbers off the coast of Western Australia.

The natural food of *Jasus lalandii* consists of mussels, chitons, and other molluscs. Sometimes echinoids and sea weeds are also found in the gut. Like other Arthropoda the crayfish periodically undergoes ecdysis. This casting of the exoskeleton not only allows for the growth of the animal but also renews the chitinous parts of the various superficial sensory organs. Ecdysis in young crayfish takes place more frequently than in older crayfish. Specimens of market size usually cast their shells once each year. At Wedge Bay the males undergo ecdysis during October, while the females cast their shells in April.

Spawning takes place during April, May, and June. The female, according to size, lays from 60,000 to 400,000 eggs. These are attached to the plepods under the abdomen and are carried by the female until they hatch. This takes place in from three to four months after laying. At Wedge Bay hatching occurs during July, August, and September.

Dr. Von Bonde has shown that during development in the egg the embryo passes through a nauplius condition. It hatches as a larva known as the prenaupliosoma. After about eight hours the prenaupliosoma undergoes ecdysis and changes into the naupliosoma. This measures about 1·7 mm. long and lasts for little more than a week. The naupliosoma then undergoes metamorphosis and gives rise to a phyllosoma larva, which is followed by a number of other phyllosomata, the exact number being unknown. These larval forms swim freely near the surface of the sea. The final phyllosoma stage measures about 35 mm. in length. It eventually changes into the puerulus, which in all essentials resembles a small adult. At this stage the young crayfish leaves the surface of the sea and lives on the bottom.

2ND SEPTEMBER, 1947

A meeting was held in the Society's Room. The President, His Excellency the Governor, presided.

The following were elected members of the Society:—Ordinary Member: Mr. M. A. Rankin; Associate Member: Mr. G. R. A. Ellis.

Mr. M. A. Rankin delivered an illustrated lecture entitled 'The Eucalyptus Regnans Forest'.

7TH OCTOBER, 1947

A meeting was held in the Society's Room. Mr. L. Cerutty, Vice-President, presided.

Professor G. E. Nicholls was elected a Corresponding Member of the Society.

Miss L. Monks and Mr. G. A. Triffett were elected Ordinary Members of the Society and Mr. J. B. Jennings was elected an Associate Member.

Miss J. Munro Ford and Professor A. L. McAulay delivered an illustrated lecture entitled 'The Organization of Plant Tissues', of which the following is an abstract:—

Miss Ford dealt with what is known about the organisation of plant cells into tissues, and suggested that some recent research in Botany may be of use in helping to solve the problem of this organisation. A unit of living matter is the cell, and cells may be grown together for special functions and specialised for certain purposes. She went on to say that active cell division takes place in meristems and here the raw materials for future tissue are formed. By methods of serial sectioning Botanists have been able to piece together the story of the development of plant cells. Examples and diagrams of primary and secondary meristems were given. The order Maturation of the special cells of the conditional system, the zylem and phloem were shown. Miss Ford spoke on the importance of hormones in initiating cell division and in controlling growth.

All living cells are capable of dividing, but in the plant they are normally inhibited, checked by the existing tissue. If the existing tissue is cut or wounded some of the living cells not usually dividing may become meristematic and produce new cells partly to replace the old, e.g., the parenchyma cells are less differentiated than other specialised tissue and may act as a secondary meristem and divide repeatedly to endeavour to close up the wound.

Another important advance in recent years has been the development of the technique of *tissue culture*. Examples and photos of recent plant tissue culture experiments were given by Miss Form. The suggestion of such cultures first came from a Botanist, the German Haberlandt in 1902, but he and his co-workers had no success and it was the Zoologists, including Carrell, who first developed the technique for growing animal cells.

It is yet to be determined why two adjacent cells of common origin with presumably the same heredity pattern, should differentiate into elements that appear totally unlike each other in structure and function.

Professor McAulay pointed out that in many cases plant meristems of common origin differentiated differently according to the nature of their surroundings. He described experiments with artichokes and maize roots made in the Physics laboratory of the University, which were designed to throw light on the factors controlling organisation.

He discussed the recognition and investigation of electric patterns which accompanied organisation. He stated that it was proposed to investigate electric and thermal phenomena in connection with growth.

11th November, 1947

A meeting was held in the Society's Room. Dr. W. L. Crowther presided.

The following were elected members of the Society:—Ordinary Member: Professor C. D. Hardie; Associate Members: Mr. E. A. Jennings, Mr. M. N. Maddock, Mr. E. H. Norton.

The following papers which had been submitted for publication in the Society's Journal were tabled, and it was agreed to submit them to the Standing Committee:—

The Structure and Stratigraphy of the Nelson River District, Lyell Highway, Tasmania, by E. D. Gill, S. W. Carey, and M. R. Banks.
Review of the Geology and Glaciology of the Mt. Field, National Park, Tasmania, by S. W. Carey and M. R. Banks.

Geology of the Gunn's Plains District, by S. W. Carey and M. R. Banks.
Geology of the Country around Tarraleah, Tasmania, by R. T. Prider. (See page 127.)

Tasmanian Araneae of the Family Hahniidae, by V. V. Hickman. (See page 21.)

A New Genus of Pseudogarypin pseudoscorpions possessing pleural plates, by J. C. H. Morris. (See page 48.)

The Taxonomic Position of Idiogarypus hansenii (With), by J. C. H. Morris. (See page 37.)

Neonatal Length as a Linear Function of Adult Length in Cetacea, by E. O. G. Scott.

Péron in Tasmania, by Professor L. A. Triebel. (See page 63.)

Note on the Occurrence of the Nematode Mermis nigrescens in the common European Earwig in Tasmania, by P. W. Crowcroft. (See page 59.)

A New Digenetic Trematode from the Gill-rakers of the Barracuda, by P. W. Crowcroft. (See page 49.)

At the request of the A.N.R.C. the Chairman presented the Ranken Lyle Memorial Medal to Dr. J. C. Jaegar, Senior Lecturer in Mathematics in the University of Tasmania. This medal was awarded to him for his researches in mathematics.

The Chairman presented the Clive Lord Memorial Medal to Dr. H. Thompson, Chief of the Fisheries Division, C.S.I.R., who afterwards delivered the Clive Lord Memorial Lecture, the title being 'Fish Welfare'. (See page 1.)

Northern Branch

Annual Report, 1947.

Of outstanding importance to the development of the Northern Branch was the agreement concluded with the parent Society in respect to membership, subscriptions, and property. The agreement may be summarised as follows:—

(*a*) *Membership:* Members nominated by the Branch to retain their membership of the Branch so long as they remain members of the Society.

(*b*) *Subscriptions:* The Society to pay to the Branch the following shares of the subscriptions of members of the Branch:—

1. Members elected prior to September 3, 1947—one-third Annual Subscription.
2. Members elected after September 3, 1947, and paying a subscription of £1 10s.—seventeen shillings and sixpence.
3. Members elected after September 3, 1947, and paying a subscription of £1 1s.—fifteen shillings.

It was further agreed that when persons in Group 1 ceased to be members of the Society, the basic number in that group would be maintained by the transfer of names from Groups 2 and 3, in order of election.

(*c*) *Property:*

1. The terms of any bequest or gift made to the Northern Branch to be observed strictly by the Council of the Royal Society.
2. All property acquired by the Branch to remain in its custody during the existence of the Branch.
3. In the event of the Branch ceasing to exist, the Council of the Royal Society to hold in trust all such property referred to under (1) and (2) above, until such time as the Northern Branch would be re-established.
4. The rights of the Queen Victoria Museum in any property held jointly by the Museum and the Branch to be recognised.

Meetings.

APRIL 15TH, 1947.

Annual General Meeting.—The Annual General Meeting was held at the Museum, Mr. F. Smithies presiding.

The Annual Report and Balance-sheet for 1946 were adopted. The following office bearers were elected:—

Vice Chairman: Mr. J. E. Heritage in place of Mr. Gilbert C. McKinlay, who retired under the rules.

Members of Council: Dr. C. Craig and Mr. Gilbert C. McKinlay, in place of Mr. J. E. Heritage and Major R. E. Smith, who retired under the rules.

Hon. Secretary-Treasurer: Mr. N. J. B. Plomley.

Dr. Hugh D. Gordon, Senior Lecturer in Charge of Botany at the University of Tasmania, delivered an illustrated lecture entitled 'Plant Pilgrims'. Dr. Gordon considered the means by which plants have become distributed over the earth's surface. After discussing the mechanics of seed dispersal and other mechanisms for plant distribution, he concluded that none of these mechanisms in themselves was sufficient to account for the wide distribution of many plants. While drawing attention to such agencies for distribution as the oceans, winds, and migratory birds, it was concluded that the principal factors involved were long periods of time and the production of large numbers of reproductive bodies.

SEPTEMBER 25, 1947.

A meeting was held at the Museum, Mr. F. Smithies presiding.

Mr. Otto R. Hellwig gave a talk, illustrated by lantern slides, entitled 'Architecture in Pre-War Europe'. Mr. Hellwig started with a general discussion of the principles of architecture, which he defined as the skill and art of organising given components with material and physchological requirements into an harmonious entity. By such a definition architecture was a functional art in the widest sense and this emphasis was brought out in the illustrations. Mr. Hellwig drew attention particularly to the absence of a national architecture in Australia. Such an architecture should not express a political belief, but the character of our country. In this way it would focus the life and ideals of the people.

NOVEMBER 11, 1947.

A meeting was held at the Museum. The President of the Society, Admiral Sir Hugh Binney presided.

Professor S. Warren Carey gave an illustrated lecture entitled 'The Geology of the Launceston District'. He traced the geological history of the area from Permian times to the present, showing by means of block diagrams the more recent changes that have taken place; as a result the Oligocene penplain was converted by faulting and subsequent erosion to give the present configuration. The history of the Tamar Valley and of the North and South Esk Rivers were dealt with, and the use of the river system for the hydro-electric power discussed.

Office-bearers, 1947:

Chairman: F. Smithies, O.B.E. (1947).

Vice Chairman: J. E. Heritage, C.M.G., LL.B. (1947, 1948).

Council: C. Craig, M.D., M.S., F.R.A.C.S. (1947, 1948); T. Doe, B.Sc. (1947); J. R. Forward (1947); Gilbert C. McKinlay (1947, 1948).

Hon. Secretary-Treasurer: N. J. B. Plomley, M.Sc.

ROYAL SOCIETY OF TASMANIA—NORTHERN BRANCH.

Statement of Accounts at February 29th, 1948.

RECEIPTS.

	£ s. d.	£ s. d.
Balance at March 4, 1947		44 3 11
Share subscriptions, Royal Society 1947		16 15 0
Bank interest—		
August 31, 1947	£0 7 2	
February 29, 1948	0 2 6	
		0 9 8
		£61 8 7

EXPENDITURE.

	£ s. d.	£ s. d.
Balance at February 29, 1948:		
Cash in bank	24 17 4	
Petty cash in hand	3 0 0	
		27 17 4
Expenditure—		
Books and periodicals	3 14 4	
Meetings	14 0 0	
Petty cash and miscellaneous	15 16 11	
		33 11 3
		£61 8 7

H. H. Pimblett, Government Printer, Tasmania.

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OF

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FOR THE YEAR

1948

Edited by

D. Colbron Pearse

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15.9.49

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The Royal Society of Tasmania

Papers and Proceedings, 1948

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PAP. & PROC. ROY. SOC. TASMANIA, 1948 (15TH SEPTEMBER, 1949)

The Rise and Fall of Charles Swanston

By

W. H. HUDSPETH

(Read 5th October, 1948)

One of the most outstanding figures in the commercial life of Tasmania during the thirties and forties of last century was Captain Charles Swanston, Member of the Legislative Council and Managing Director of the Derwent Bank. Indeed. in the latter capacity he is described by a contemporary as holding 'pecuniary dominion over a moiety of the island'.(1)

His activities, moreover, were not confined to Tasmania, for, as we shall see, through his participation in the Port Phillip Association, of which he was one of the founders, he exercised a profound influence upon the colonisation of Victoria.

It is therefore a little surprising, as pointed out by a recent writer,(2) that more attention has not been paid by biographers to his career—an omission which it is the purpose of this paper to rectify.

Of his pre-Tasmanian life we know little, except that he had been in the Army in India, where he held a Commission as Captain in a Regiment of Mounted Infantry in Madras, and for a time was Deputy Adjutant-General of the Indian Army. There he appears to have led the ordinary life of a young subaltern, hunting and shooting in his spare time, and enjoying the society of a wide circle of friends.(3) During one of his furloughs, he is said to have visited Tasmania and to have been sufficiently impressed by its attractions to repeat his visit, with the possibility of settling there.(4)

In pursuance of this purpose he arrived at Hobart Town, on board H.M.S. 'Success' on 4th June, 1829, with his wife and family, and bringing with him a considerable amount of capital (some £10,000).

Although nominally on leave from military duties, he evidently decided to stay in this country, for soon after his arrival he purchased an estate on the River Styx, 'Fenton Forest' and also the fine property at New Town, known as 'New Town Park'.(5) He also acquired land at Kingborough and some 4200 acres in the County of Westmorland.

But, unfortunately, as it turned out, for himself and many others, it was not Swanston's fate to become a country squire. He had probably brought letters of introduction to Lt.-Governor Arthur, to whom such a man, with military credentials and ability, was bound to appeal, and before long we find him dining at Government House and on intimate terms with the little military clique then in control of affairs at the capital. Captain John Montagu and Captain Matthew Forster, the Lt.-Governor's two nephews-in-law—who held respectively the important posts of Colonial Secretary and Chief Police Magistrate—were among his chief associates. Montagu was perhaps his closest friend, and the intimacy that sprang up between them continued until long after the latter had left Tasmania, leaving Swanston in charge of his affairs in Australia.

Swanston was a staunch supporter of Lt.-Governor Arthur, and during the Franklin regime he was regarded as the head and front of the so-called 'Arthur faction'.(6) (See foot-note.)

It was probably due to Arthur's influence that in 1832 Swanston was nominated a Member of the Legislative Council, and in the same year was appointed Managing Director of the Derwent Bank, in which the supporters of the Government had a predominant interest. Soon after accepting this post he resigned from the Army, and thereafter devoted himself to his new duties.(7)

In addition to his political and banking activities he carried on an extensive business on his own account, as an import and export agent, in wool, tea, sugar, rum, and other commodities, in the course of which he formed connections with business houses in India, China, and elsewhere.(8)

The Derwent Bank

It is not my intention to enter upon a detailed account of the Derwent Bank. The subject has already been ably dealt with by Professor S. J. Butlin, (9) and it would be superfluous to go over the ground again. But the operations of that ill-fated establishment are so closely interwoven with the career of its Managing Director that some references will have to be made to it from time to time in the course of this narrative.

The Bank was promoted in 1827 by a group of leading citizens in Hobart. It was, in reality, a partnership for 14 years, with the usual liabilities attached to that relationship. The Deed of Partnership, prepared by Robert Pitcairn, the Bank's solicitor and the chief conveyancer of his day, is a formidable document. Among its imposing array of signatures may be found those of many prominent officials of the Arthur regime—John Montagu, Colonial Secretary; Alfred Stephen, Solicitor-General; Douglas Fereday, Sheriff; Joseph Hone, Master of the Supreme Court; Jocelyn Thomas, Colonial Treasurer; Edward Dumaresq, Deputy Surveyor-General—and many other well-known men in the north and midlands, as well as in the south of the island.

The Bank's initial capital was £20,000 divided into shares of £100 each (10), and the seven members of its first Board of Directors were Joseph Hone; John Dunn; John Kerr; Patrick Wood; William Barnes; Peter Archer Mulgrave; and James Haydock Reibey. Joseph Hone was the first Chairman of Directors.

Franklin, in his narrative, says that Montagu held, for himself and others, a large number of shares in the Derwent Bank, and that during his visit to England, in 1839 to 1841, he actively canvassed there on behalf of the Bank, and brought back many commissions for it. He also asserts that Montagu and Swanston were the chief representatives of the Bank, and that each relied on, and augmented the influence of, the other.

He cites an article in the 'Advertiser' of 20th June, 1843, in which it was alleged that Swanston's motives in attacking him were, firstly, his annoyance and chagrin at Montagu's dismissal, and secondly, his hope that Montagu might be reinstated, and the Bank thereby regain his official influence.

Franklin also alleges that a considerable portion of the press was 'completely under the feet' of the Bank—that the 'Hobart Town Courier' (of which Thomas Macdowell was editor) and its proprietor (Elliston) were deeply indebted to the Bank, and that when Thomas Macdowell became proprietor of the 'V.D.L. Chronicle' both he and his brother Edward Macdowell used its columns for bitter attacks upon his administration. Edward Macdowell was Swanston's son-in-law, and had been removed from his office of Attorney-General by Franklin. Either Swanston or Montagu—Franklin says—could easily have checked, or stopped, the malicious criticisms of the Macdowells' if they had cared to do so.

(Franklin—'Narrative of some passages in the history of V.D.L.', pp. 7, 8, 13, 17, 18, and 20. See also Montagu's 'Book').

The Bank staff consisted of two—the cashier, Stephen Adey, and the accountant, John Leake, of Rosedale, Campbell Town.

It opened for business on 1st January, 1828, in premises in Davey-street, formerly used as a public house, called 'The Barley Mow', which stood on what is now the garden at the back of the Tasmanian Club, close to the office of Mr. Pitcairn, which was in the building now known as 'Ventnor'. From the letters written at the time by young Leake to his wife, we gather that the business methods of the infant establishment were somewhat elementary. For instance he writes: 'We have been principally employed in writing out Bank Notes, and have since opened the Books'.(11); and later, after the first half-yearly meeting: 'We had a very favorable meeting. I got the books to balance exactly, which, as I am so much out of doors, was almost a miracle. The Governor, however, has some objections to the Government Officers being Manager and Directors, and we therefore expect some change.'(12)

This last remark is evidently an allusion to the criticism in the press of the day, inspired, no doubt, by the Bank's older rival, the Bank of Van Diemen's Land, criticism which resulted in the resignation of all the Government officials in the Bank and its reorganisation under the sole control of a full-time salaried Managing Director, William Henry Hamilton. Before this the Bank had opened a savings bank branch for the receipt from the Government of deposits on behalf of convicts.

From this humble beginning the Bank's business grew and expanded with some success. Within two years the premises in Davey-street had become inadequate, and it became necessary to find further accommodation. A block of land fronting on Macquarie-street was purchased, a new banking chamber erected, and in 1833 the establishment moved into its new quarters.

Meanwhile, in 1832, Hamilton had retired and gone to England to act as the Bank's representative in London, and Charles Swanston had been appointed Managing Director in his place.

From this point we can take up the story from the letter books of Swanston and of the Bank.

The period of the twenties and thirties of last century was one of great development in Australia. Emigration was in full swing, land settlement was going on apace, and the rapid growth of trade and of the pastoral industry was bringing with it an ever-increasing demand for capital. Interest rates were extremely high—from 12½ to 15 per cent being readily obtainable—and the passing in 1830 of the Usury Act (11 Geo. IV. No. 6), which declared that English law relating to usury did not extend to Tasmania, opened up a bright prospect for the money-lender. The supply of local cap'tal was limited, and it did not take long for the Derwent Bank's new Managing Director to realise that the Royal road to success lay in obtaining money from abroad at a comparatively low rate of interest and lending it out at a very favourable profit.

Accordingly, in 1834 the capital of the Bank was increased to £100,000, and Swanston proceeded to embark upon the perilous path which was eventually to lead to his ruin and that of the institution over which he had control.

He had a wide circle of influential friends in India and Great Britain, and to them he proceeded to write glowing reports of conditions in Tasmania, with tempting offers of gilt-edged securities, either in bank shares or in mortgages over real estate. There are many such letters in his books, of which the following is a specimen: 'Money here is as much wanted as ever. I do not think you can do better than send your funds to this Colony. For many years to come you can calculate on an interest of at least 10 per cent, and for the next two or three years,

I have no doubt, on good mortgages 15 per cent will be had. Our banks continue to yield a most profitable interest for money invested. In the Derwent Bank, of which I have the management, a greater interest can be obtained than on mortgage '.(13)

After this attractive picture it is a little surprising to find him writing, seven months later, to his agent (Buchanan) in London: 'Our Colony is in the most depressed state. Treasury Bills are at a premium of 6 per cent, and from the great sales of land and the drafts daily made on our Treasury here by the Home Government, specie as a circulating medium has almost disappeared. We are, in consequence, in as sad a state as it is possible for a Colony to be . . . The Black Whale fisheries have been far from successful this year, and, from the severity of the late winter, wool will fall short of the usual quantity exported from the severe losses that have been experienced amongst the flocks.'(14)

Somehow or other he had established contact with a wealthy Scotsman named George Mercer (of whom we shall hear more anon), and to him he writes in 1834: 'I have purchased for you four shares in the Derwent Bank at £100 per share (£110 nominal value), and shall continue to buy more; bank shares being the best investment in the Colony.'(15)—and a few weeks later, after the increase of capital: 'I have increased your bank shares to seven, and am about to make you a partner to the extent of £5000 in twenty-six old shares, paid up, and eighty-five new shares, of which 25 per cent only is now called up. Mr. McKillop and Mr. Learmonth have each invested £2500 in shares, with the intention of doubling their interests when funds arrive.'(16)

In January, 1835, he enlists the interest of another wealthy client—this time in India—Sir George Best Robinson, to whom he writes through his agents in Canton, Messrs. Jardine Matheson & Co.: 'There are', he says, 'two modes of investment here—mortgages and bank shares. Bank stock affords equal security. The banks of this Colony are joint stock companies—banks of deposit, of issue and discount. Therefore they are not in any way engaged in trade, or in any speculations, beyond that of discounting bills; and so closely interwoven with the affairs of the Colony that one cannot fail without the other. The Derwent Bank is conducted on the principles of the Scotch banks, and has the principal part of its loans secured on deeds of lands and houses. Its stock is divided into shares of £100 each, which have a premium at present of £11 per share—the Bank possessing a sinking fund to that extent over and above the capital paid up. Dividends have hitherto been at the rate of 15 per cent payable half-yearly.'(17)

You will notice that he omits to state that the Bank was a partnership, involving unlimited liability for every partner in the event of its failure.

Three days after this letter he again addresses a gloomy report to Buchanan, in London: 'The affairs of our Colony are by no means in a wholesome state, owing to the large importations from London and the consequence of forcing the goods on to the market at extended credits, which has caused much speculation, and will, I fear, be attended with loss to the shippers.'(18)

It is difficult to reconcile these contradictory accounts of the conditions then prevailing in the Colony. Was the Managing Director deliberately showing one side of the picture to his personal agent in London, and another to the unwary investor, for the purpose of promoting the interests of the Bank, and, incidentally, of himself? Or was he suffering from an optimistic complex, and sincerely believed in the soundness of his advice? Perhaps an extract from a letter, written about this time, to George Mercer, will provide a clue to the answer. It was on the subject of the V.D.L. Coy., in which Mercer had taken shares, and towards which Swanston,

for some reason, always displayed an animosity which is elsewhere lacking in his correspondence. He may have had a row with Mr Curr, the Manager, when the latter was in the Legislative Council, or—more probably—he was embittered by the liberal treatment afforded to that Coy., compared with the scanty consideration given to his own pet scheme, the Port Phillip Association, about which I shall have something to say at a later stage.* At any rate, this is what he says: 'I regret to learn that you have had anything to do with the V.D.L. Coy. I doubt whether you will ever now get back the price of your shares. The whole scheme has been a job from beginning to end, and is continued such by the present manager, Mr Curr, to suit his own views and plans. I do not know who is the deceiver, but this I will say for him, that there is the most gross deception practised, either by the manager in this Colony, or by the managers in England, as to the real state of the affairs of the Company . . . . '*How easily,*' he goes on. '*you folks in England are gulled! The Englishman will swallow any scheme, however absurd and monstrous it may be.* This notable Company last year, like the quaking mountain that brought forth a mouse, exported half-a-dozen bales of wool—the returns of an expenditure of £150,000—and when this expenditure is doubled, an export of *beef* to the Mauritius may be, perhaps, as magnificent.'[19]

I wonder what the writer of that letter would say if, today—100 years later—he could see the wonderful progress of the V.D.L. Coy., and compare it with the ignominious end of the Derwent Bank, and of his will-o-the-wisp, the Port Phillip Association! . . .

It may be noted here that Swanston was at this time engaged in purchasing land in Tasmania for George Mercer. He had recently acquired for him the estate of 'Lovely Banks', at Spring Hill, and his correspondence on the subject contains much useful information as to the values of land and stock at that time in the Colony. The boom in the wool trade was on, and prices of land, stock and produce had risen to unprecedented heights. In October, 1835, he writes: 'I am so puzzled with the change that I really am alarmed at laying out your money'[19]—and again: 'Land has risen in the Colony to a price which I never believed it would. One pound per acre is the lowest price now asked, and £1 10s. and £2 per acre are freely given'.[20] Sheep and cattle had also risen in value.

This state of things was, to some extent, consequent upon the recent discovery of the hitherto unknown territory at Port Phillip by Messrs. Henty and others, and the growing attention being paid to that part of Australia.

THE PORT PHILLIP ASSOCIATION, 1835 TO 1838

The story of the Port Phillip Association has been often told,[21] and it is only necessary here to give a brief outline of it, to enable us to understand the significance of the facts disclosed in the correspondence of Charles Swanston with George Mercer and other members of the Association.

It begins in 1825, when John Batman, who had come down from his birthplace at Parramatta in New South Wales to settle in Tasmania, was struggling to wrest a living for himself and his family on his farm, 'Kingston', near the

* Adey, who was Agent at Hobart for the V.D.L. Coy, as well as Cashier of the Bank, transferred £20,000 of the Coy's money from the V.D L. Bank to the Derwent Bank without the knowledge of Edward Curr. When Curr got to hear of it he ordered Adey to return the money to the V.D L. Bank. This was probably one of the reasons for Swanston's antagonism

foothills of Ben Lomond. He was by that time beginning to tire of the unending toil and monotony of his lonely existence, and welcomed with joy the arrival, one day, of John Helder Wedge, the surveyor, who had called to mark out the boundaries of his property. He and Wedge had many tastes in common, including a love of adventure and exploration, and during the visit they discussed the plan of crossing to the mainland in search of land more suitable for settlement than the rugged district of Fingal. Nothing actually came of the talk at that time, but when Wedge departed the seed had been sown in the mind of John Batman—seed which was to germinate into vigorous growth later, when he heard reports of the wonderful discoveries in Victoria of Hovell and Hume.

In 1827 he found a fellow-enthusiast in Joseph Tice Gellibrand, ex-Attorney-General, and with his co-operation he applied to Sir Ralph Darling, Governor of New South Wales, under whose jurisdiction the region of Port Phillip then lay for a grant of land in the neighbourhood of Western Port. But their request was refused, and there for the next five or six years the matter rested.

But in the meantime the Henty brothers had crossed the strait from Launceston, and settled at Portland Bay, without active opposition from Sydney, and the news of this, coupled with the publication of the full account of Hume's and Hovell's discoveries, revived interest in the project, and Batman set to work in earnest to secure the support he needed.

It was not long in forthcoming. A number of leading citizens were approached, and in 1834 a syndicate was formed, with the object of fitting out an expedition to explore the shores of Port Phillip, with a view to establishing themselves there and developing the rich lands of which such glowing accounts had been heard.

This syndicate, which was called 'The Port Phillip Association', consisted of the following members:

Joseph Tice Gellibrand, ex-Attorney-General.
Charles Swanston, M.L.C., Managing Director of the Derwent Bank.
Henry Arthur, Collector of Customs.
William Bannister, Sheriff.
James Simpson, Police Magistrate.
John Robertson, Merchant.
William Robertson, Merchant.
John Helder Wedge, Surveyor.
John Thomas Collicott, Postmaster-General.
Anthony Cotterill, District Constable.
William Gardner Sams, Under-Sheriff.
Michael Conolly, Merchant.
John Sinclair, Superintendent of Convicts.
George Mercer, Investor.
John Batman, Settler.

Gellibrand and Swanston were the leading spirits of the speculation, and Batman, because of his experience as a bushman and his known ability in handling the natives, was unanimously selected as leader of the expedition. George Mercer, the only absentee member, was included in the enterprise by Swanston, without previous consultation, partly, no doubt, because of his wealth, and partly because it was felt that, in the event of trouble with the Home Government, it would be as well to have a representative of the syndicate on the spot, in London.

On 10th May, 1835, Batman sailed from Launceston in the 'Rebecca', a tiny schooner of 30 tons, accompanied by three white men and seven Sydney natives. The latter had been employed by him in his efforts to conciliate the Tasmanian tribes who had been causing so much trouble to the Tasmanian Government. Batman was armed with a supply of blankets, tomahawks, knives, beads and other trinkets, intended as presents for the Port Phillip natives. He took with him also two elaborate deeds of conveyance, duly engrossed on parchment, which had been prepared by Gellibrand, in anticipation of a deal being successfully negotiated with the primitive inhabitants of the area which they hoped to acquire.

The little party arrived safely on the shores of Port Phillip, and in due course met a number of so-called 'chiefs', with whom they parleyed and eventually came to terms. Fascinated by the gifts so liberally distributed by the white visitors, and dazzled by the promise of an annual tribute, or 'rent', the guileless savages set their marks to the deeds, and thus signed away 600,000 acres of land since proved to be the finest in the Colony of Victoria, if not in Australia, including the future sites of Melbourne and Geelong—an area which to-day would be worth many millions of pounds.

The two deeds which concluded this Gilbertian transaction are endorsed, respectively, 'Grant of the Territory called "Dutigalla"', and 'Grant of the Territory called "Geelong"'. They are both dated 6th June, 1835, and are preserved as curiosities in a glass case at the Public Library in Melbourne.

The conclusion of the ceremony was celebrated by a magnificent feast, and a corroboree performed by the dusky members.

So far, so good—the expedition had achieved its object, and nothing now remained but to consolidate their position and to obtain the sanction of the authorities to the purchase.

It would be tedious to relate in detail the subsequent operations of the Association and their protracted efforts to obtain, either in Sydney, or in London, recognition of their title to the magnificent territory thus acquired. I propose merely to cite such passages from the correspondence of Charles Swanston as may throw light upon the activities of the syndicate and upon the motives and methods of its members.

In July, 1835—one month after the signing of the deeds—we find Swanston writing to George Mercer with a copy of an indenture relating to the employment of persons at Port Phillip on the Dutigalla estate: 'This paper', he says, 'will be a further proof of our anxiety and desire to protect the natives, if further proof is wanting to convince the Home authorities of the sincerity of our intentions in that respect. The accompanying paper is a memorandum sent to me by Mr Bannister . . . it puts before you clearly Sir George Murray's sentiments regarding the proceedings of the British Government towards the aborigines of these Colonies, and at the same time gives you Col. Arthur's opinion, in the year 1830, of Mr Batman's treatment of the people. He has, I understand, within these (last) few days stated in the presence of Mr Learmonth that this very gentleman (of whom he had so high an opinion in the year 1830) had destroyed more natives than any other man, and that he was, consequently, an unfit person to place in charge and in communication with the natives of Port Phillip. On what grounds Col. Arthur has made this statement we are unable to discover. All I can say is this, that Col. Arthur up to this hour treats Mr

Batman with confidence, and assures him that he considers his former services with the natives of this Colony to have been such as to merit every consideration from the British Government.

That Mr Batman understands the management of these people is quite certain from the success which has attended his expedition to Port Phillip, but, more particularly so, from his being always accompanied by natives of Sydney, who would on any occasion lay down their lives for his. The gentlemen of the Association have, at all events, the most perfect confidence in Mr Batman, and they feel so satisfied of his discretion and of his power with these people as to have no fear of being interfered with by squatters . . .

I shall in all this month of next year look forward most anxiously for letters from you on the subject of our territory of Dutigalla and Geelong.

P.S. Mr Harrison, the Counsel for the Treasury, I understand, is of opinion that grants obtained similar to ours were binding. It would be desirable to obtain his opinion and co-operation, if possible, and it is also advisable to obtain the opinion of the lawyers, after a consultation had at the Chambers of the Senior Counsel. The better course will be to fix a consultation when the cases are left '.(22)

It is evident from this letter that even at this early stage the members of the Association were by no means certain of the validity of their title. The reference to Arthur's attitude towards Batman is interesting, because he is reputed to have supported the Association for two reasons—one that his nephew, Henry Arthur, was a member, and the other, because it had been suggested that the new settlement might well be taken out of the jurisdiction of New South Wales and placed under his control.

The following month Swanston writes: 'If you find that we shall have any chance of obtaining the concession of the territory at Port Phillip you must write me as to what share your son is to have of it . . . I intend to invest in the new speculation £4000 on our joint account (subject to your approval)'. He then goes on to paint a rosy picture of the future: 'I look upon this speculation as a fortune for my children, even if we should only be allowed to keep quiet possession of the country. You will perceive by the report of Mr Wedge, who is now at Port Phillip, who was for a long period of years a surveyor in this Colony, and who resigned his situation to go there, that the country is everything Mr Batman reported it to be. The account of Buckley is most curious. To him Col. Arthur has sent a free pardon, so that now, with his aid, we shall have most complete control over all the natives, and will, through his information, be enabled to take possession of the finest tracts. He is chief of a tribe and possesses the most complete control over his people. We have engaged a medical man (Mr Thomson) who is to act also as a Catechist. We at present feed all the tribes daily, but on Mr Batman's return they are only to be fed every full moon. Clothes and presents of all kinds have been sent over to be distributed to them. No means will be left untried to conciliate and keep them on good terms. Buckley will be our mainspring'.(23)

William Buckley, the escaped convict, after thirty years or so spent among the natives of Port Phillip, had appeared on the scene in June, and joined Batman's party as a kind of liaison officer between them and the natives.

Up to this time the Port Phillip Association had been a very unorthodox body, with no deed or other document defining the terms of the partnership. But now that its members had acquired such a princely heritage, it became necessary to put matters on a proper footing. A deed was prepared vesting the property in

Swanston, Gellibrand and Simpson, in trust for the Association, and the whole 600,000 acres were divided into seventeen parts or shares. Of these, two were allotted to Batman, one to each of the other members, and the remaining two were put into the name of George Mercer 'in trust'. Batman was allowed to select his shares, and the rest were parcelled out by lot.(24)

The destination of the two shares held in trust by Mercer has never been disclosed, but we shall get a hint of it presently.

Meantime, while these self-deluded optimists were indulging in day-dreams of the shape of things to come, events were moving in other directions, and they soon received a nasty shock.

Sir Richard Bourke, who had succeeded Darling as Governor of New South Wales, had, of course, been informed of the invasion of his territory, and took prompt steps in retaliation. On 26th August, 1835, he issued a proclamation, declaring that the bargain made with the natives by the Port Phillip Association was an infringement of the rights of the Crown, and therefore null and void, and that all persons found in possession of the lands included therein were trespassers, and liable to be dealt with in like manner as other intruders upon the vacant lands of the Crown within the Colony of New South Wales.

This was a bombshell, though not altogether unexpected, as appears from Swanston's next letter to Mercer, in which he says: 'General Bourke's proclamation is in all the papers. We expected this . . . , but it has not deterred us in our operations, as we consider it a mere matter of course.'

He then proceeds to tell of the arrangements made for further purchases of stock, and for their transport to the mainland, including the chartering of one vessel and the buying of another. He also speaks, rather slightingly, of certain 'squatters' who had gone over from Tasmania—(this would be the party led by John Pascoe Fawkner, who had occupied land on the Yarra). 'We will,' he says, 'no doubt, easily get rid of them—there is abundance of land without interfering with our domain,' and he concludes with this remark: 'I have no hesitation in saying that, if our claim is sanctioned by the Home Government, the Port Phillip establishment will be the first in Australia.'(25)

As a matter of fact, the fulminations of the affronted Governor in Sydney—so airily dismissed by Swanston as 'a mere matter of course'—were not really so regarded, as is apparent from the letter which followed soon after: 'Col. Arthur,' he writes, 'seeing our preparations to take possession of Port Phillip, had several interviews with Mr Batman and the other gentlemen concerned, when he approved of the letter (Batman's) being addressed to him for the purpose of being forwarded to General Bourke, which he is to follow up with a recommendation that a military or civil officer should be sent there by him; that if General Bourke did not do so, Col. Arthur will then take upon himself to do so from this Colony. If this measure is adopted it will be a recognition of our claims by this Government at all events, and will prevent our being interfered with by other parties until the pleasure of the Home Government is known'.

He then assures Mercer that he is free to withdraw if he does not approve of being included in the enterprise, and promises, in that event, to repay all monies expended on Mercer's behalf: 'Should you not personally wish', he says, 'to engage in it, I have to hope that you will, notwithstanding, give to us the full weight of your influence, and if you cannot take the management of the trust we have forced upon you that you will have placed it into the hands of someone who will act for you in our behalf, and carry through with the Home Government our claims and proposals. We are most anxious and desirous that the Home

Government should accept our offer of a yearly tribute, rather than of a purchase money. It would be in every sense the most advantageous bargain for us to make.'(26)

In March, 1836, he writes again: 'Our anxiety to hear from you and to learn the determination of Ministers is very great, more particularly since we have ascertained beyond a doubt that the country we have taken possession of at Port Phillip is the finest yet discovered . . . I forward you a map of the country as it has been divided mutually among the Association . . . You will perceive that our (divisions) fall together with the two shares *laid aside to be given away by you in England* . . .

You may therefore easily form some idea of our anxiety to learn the result of your application to the Home Government, and to know what hopes there are of keeping this fine country.

So fine a country as Dutigalla is worth a great deal more than we recommend you to offer to the Home Government—we are willing to give almost any sum of money for it'.

Then follow instructions to offer 2s. 6d. per acre, and if this is accepted to come to an immediate settlement. If, however, the Government refused to confirm the Grants, or to accept any offer, and decided to put up the land for sale by the Colonial Government, then he suggests certain alternatives which need not concern us here, and he ends the letter with these words: 'Therefore, my dear sir, do not lessen your exertions in our favour. But, should it so happen that the Government will not acknowledge the Association, nor give us any reward for our enterprise, then I hope you will, if possible, afford the means that we individually may be enabled to keep for ourselves out two lots, and avail ourselves of the splendid opportunity of forming for our children the noblest landed estates,'(27)

Further light is thrown upon the two shares so mysteriously entrusted to Mercer by a later letter from Swanston to James Simpson: 'The two shares which were first placed in Mercer's hands, to be at his sole disposal, and to be appropriated in whatever way he might consider most judicious, were appropriated, for, as you may suppose, it would have been impossible to have carried on the correspondence and done what he has done, although unsuccessfully, without very great aid in London and the only way to obtain this assistance was with the means placed in his hands. To have remunerated the parties so employed with money would have cost us more than we could have stood.

Mr Mercer did hint in one of his letters to whom he thought it necessary to give the shares, but most properly never, even in his private letters, has he ever mentioned their names, and to ask him the question I never will, knowing too well how delicately these matters must be managed in London'.(28)

And there, I think, we may leave this unsavoury item in the promoters' negotiations in London.

The rest of the story is soon told. As might be expected, the British Government turned a deaf ear to all the arguments and proposals put before them. A despatch was sent by Lord Glenelg to Sir Richard Bourke, and on 9th September, 1836, the latter issued a second proclamation, notifying that His Majesty's Government had authorised settlement at Port Phillip under the same Crown lands regulations as were in force in other parts of New South Wales. The land was to be put up for sale by auction in Sydney.

But, although their bubble had burst, the syndicate felt that all was not lost. Swanston, Gellibrand and Simpson went up to Sydney and laid their claims before the Executive. After much discussion they were allowed, as an act of

grace, a remission to the amount of expenses they had incurred on any purchases they might choose to make at the forthcoming sale. This remission was fixed at the sum of £7000, and, at the sale, which was held in Sydney on 13th February, 1838, an agent for the Association bought about 9500 acres near Geelong for £7919 7s. 7d., from which the sum of £7000 was remitted. We can imagine the disappointment of the members of the Association at this end of all their dreams. But they seem to have taken it philosophically, at any rate on the surface.

In a letter to a friend, written shortly after the sale, Swanston remarks: 'My own affairs go on perhaps not quite as well as I could wish, but satisfactorily. But had Government acted towards us with a little more liberality I should perhaps have been too successful'.(29)

These were brave words from a man who had seen a princely fortune vanish into thin air!

In another letter, however, written a few weeks afterwards, he shows us how bitter he really felt: 'The shareholders, who have in no way moved hand or foot in the question beyond paying their share of expenses, which one or two have not even done to this day, consider that the honour which has been conferred upon the acting members, who have had all the trouble and anxiety on the subject, have been sufficiently well paid for their exertions by such honour conferred.*

All I can say to them (is) that, had it not been for the exertions of my own friends and Mr Mercer's exertions, the £7000 would not have been confirmed by Lord Glenelg—so Col. Arthur and my friends write me.'(30)

We need not follow further the fortunes of this little band of adventurers. One by one, its members fell by the wayside, and their shares were taken over by the survivors.

After years of worry and bitterness, of reproaches and recriminations—years during which we find Swanston declaring that he was overloaded with liabilities and worn out with anxiety,(31) he and George Mercer appear to have emerged as the sole Proprietors.(32)

It is not clear what ultimately became of Mercer's share, but in the end Swanston himself did not do so badly, and in the final winding up of his affairs his assets at Port Phillip were estimated to be worth upwards of £50,000.(33)

Years of Decline, 1835 to 1849

The next ten years were to witness a gradual decline in the affairs of Charles Swanston, and of his pet creation, the Derwent Bank.

Who could have foreseen that the financial magnate of the middle thirties, that 'arrogant, proud, conceited and officious man'—as he is described by one who knew him,(34)—the man who, at the pinnacle of his power, could write to a client of the Bank these words: 'As your style of address is not such as I can submit to, I have to request that you will, on receipt of this letter, nominate some other person as your agent to take charge of your affairs here, for I will have nothing more to say to them'.(35)—Who could have foreseen that the same man would, ten years later, broken in mind and body, and crushed by an overwhelming weight of liabilities—himself be reduced to penury, and a fugitive from the wrath to come?

* This letter has evidently been miscopied by a clerk. The obvious meaning is that the shareholders referred to thought that the active members had been sufficiently rewarded 'by the honour conferred upon them' (whatever that was)

As so often happens, the process of such declension was gradual, and almost imperceptible, and, to do him justice, was set in motion by forces beyond Swanston's control.

John Dunn had opened his Commercial Bank of Tasmania in 1829, but as yet its competition had not seriously affected the other banks. But the advent in 1834 of the Bank of Australasia, with its vast resources of foreign capital, was another matter. This caused indignation and apprehension among the local bankers, though at first Swanston professed to treat it lightly. In a letter to George Mercer he writes: 'Mr Kinnear and the *great Banking establishment* have arrived. As there is a difficulty in obtaining gentlemen of respectability to join them as directors they cannot mature their schemes in Hobart Town. We cannot tell what effect their measures will have upon us. Should they begin by discounting at a low rate we must do the same; the consideration then will be whether it will be for our interest to continue our capital in banking at a rate of profit lower than can be obtained if employed in other ways, of which this Colony offers so many openings'.(36)

As anticipated, the first thing the new bank did was to reduce the rate of discount from 10 per cent to 8 per cent. But this, apparently, did not worry Swanston, for in September 1836 he writes: 'Our dividend was 6½ per cent for the half year ending in July. The V.D.L. Bank gave 5 per cent. What the Bank of Australasia will give it is impossible to tell. Whatever it is, it must be very small. The reduction of the rate of discount . . . will, of course, materially reduce our profits, but I should hope, notwithstanding this reduction and additional competition in the banking here, that our dividends will never fall below 12 or 13 per cent. The Bank of Australasia has cut their own throats by reducing the rate. Mr Kinnear regrets his error—but too late'.(37)

As soon as the Derwent Bank's astute managing director had got wind of the impending arrival of its formidable competitor, he had taken measures to meet its opposition. As already mentioned, in 1834 the bank's capital was increased to £100,000 and he embarked upon a vigorous campaign to sell the new shares. Letter after letter was written—all in the same strain—calling the attention of investors to the wonderful returns they could obtain by investing their money, either in the purchase of shares, or upon mortgages secured through the medium of the Bank. Dividends were promised of 14 to 15 per cent upon the bank shares and interest on mortgages from 10 to 15 per cent.

Attracted by these glittering prospects, money flowed in from all quarters in an ever-increasing tide, which not even the arrival of another 'foreign' competitor in the shape of the Union Bank of Australia—which opened its doors in 1838—could stem.

Writing in 1839 to Stephen Adey, who was then in England, he says: 'The applications for shares are now so great that I could easily increase our capital beyond £100,000'.(38)

The boom in pastoral properties, caused by the demand for wool and other products, was then rising to its height, and 'gild-edged' securities were readily obtainable at rates of interest scarcely credible at the present day.

And so, for a time, the Bank floated on the crest of the wave, and Swanston, elated by his success, began to put into effect a plan which had been simmering in his mind, under which the Bank should cease to be a bank of issue and become chiefly a mortgage bank, fed by funds from overseas.

With this end in view, the issue of notes was suspended, and in 1841 the Bank's capital was raised to £250,000.

It may be observed here, that not all the money thus obtained was invested on mortgages. Quite a large amount of the funds received from abroad was sunk in the purchase of shares in the Port Phillip Bank, which had been founded in the infant City of Melbourne by Swanston and his associates, under a board of directors of which the chairman was Major G. D. Mercer, a son of his Scottish friend George Mercer. These shares were issued in Swanston's name, and gave him considerable voting power and influence in the operations of that Bank. Other overseas moneys went into Swanston's private ventures at Port Phillip, which, as we have seen, were at that time causing him some embarrassment, and in the final reckoning it turned out that many so-called 'securities' were either valueless or had no existence at all. In a letter written in 1850 by Mr John Walker, the liquidator of the Derwent Bank, he says: 'Your are aware that many parties have entrusted Captain Swanston with money under the impression that they have good security, and that the money had been laid out at Port Phillip and other places, and that they hold no such security, and that many of the transactions are of such a nature that they will not bear investigation'.(39)

There is also evidence that some of the money entrusted to the Bank had been used in the purchase of wool.

But, in the meanwhile, for a year or two, the Rake's Progress went merrily on, with Swanston sitting in his chair, chanting his refrain of 13, 14 and 15 per cent—with an occasional bonus of 10 per cent thrown in,(40)—and raking in the shekels from the eager crowd, who fought and jostled to secure a seat on the financial round-about.

In Swanston's letter book for 1841 we find him writing to Hamilton (the Bank's agent in London), urging him to persuade capitalists to take up shares in the Bank, and, wherever possible, to convert their mortgages into bank stock, where, he urged, the security would be better, and the returns more punctual. At the same time he himself writes to prospective clients (many of them women), telling them that he was putting their money into bank shares 'as the best investment' he could make for absentees.

But soon there was a rude awakening. The cloud of depression, which had been looming on the horizon—no bigger than a man's hand—gathered, and then, suddenly, descended. The boom had burst.

The price of wool fell to 1s. per lb., and values of land and stock dropped 50 per cent. The unhappy pastoralists were no longer able to pay the fantastic interest on their mortgages, and found themselves faced with ruin. They were even forced to boil down the carcases of their sheep for tallow, and there was a flood of insolvencies.

This state of affairs, of course, had a disastrous effect upon the Bank. Its dividends fell lower and lower, and the angry and frightened overseas clients began to clamour for the sale of their shares, and the immediate return of the money they had entrusted to the managing director for investment.

In a private letter—one of the very few of that nature in the books—written by Swanston to his friend Captain Montagu, then at the Cape—he reveals clearly the state of his mind at that time, and his apprehensions for the future:

> 'My dear Montagu
>
> . . . Things have taken since your departure such a sad turn that I begin seriously to be afraid of a general bankruptcy. All kinds of property, whether stock, land or shares in companies, are unsaleable, except at ruinous prices. Land and stock are not worth half what they were three years ago. Daily failures are the consequence.

> In Melbourne the Port Phillip Bank has closed, and it is said will not repay to the shareholders 10s. in the pound.
>
> In Launceston the failures are becoming daily more serious. I begin, consequently, to tremble for the banks—as yet we have sustained no loss, but we cannot expect to escape. We have thought it advisable for the present not to increase our capital or to borrow any more money . . . (41)

In another letter—this time to Hamilton—he paints an even more gloomy picture: 'So great distress and depression perhaps never overtook so rapidly any country as have overtaken this Colony in the last few months. I had foreseen that insolvencies would take place also, to a greater extent than in any former period, but the extent to which they have gone has far exceeded anything I could have believed would have been the case. We can expect no further capital from abroad, and it is not to the interest of the Derwent Bank to accept any or, increase its capital at present rates of interest. Therefore no more money for investment or shares must be accepted'.(42)

And through all the later pages of his letter book of this period we find the same *leit motif* of sadness and disillusionment, which finally culminates in an outburst of regret that he had ever come to Tasmania.(43)

And there was, indeed, good reason for his disquietude.

The Port Phillip Bank had been grossly mismanaged by its directors, who, with the exception of the managing director, had been lending the Bank's money to each other and to their friends for their private speculations, on security of bills which turned out to be worthless. In 1842 the Bank closed its doors and the shareholders were left with a loss of nearly 60 per cent of their capital.(44)

The Derwent Company, which had been formed out of the wreckage of the Port Phillip Association, had got into difficulties and was wound up in the same year.

The contract made by Swanston with the Government for the construction of water works for Hobart Town had been cancelled for lack of funds.

The Kapunda Mine in South Australia, in which he had sunk a considerable amount of money, had turned out a failure.

And—to cap all—he now saw his beloved Derwent Bank drifting slowly, but surely, on to the rocks of bankruptcy.

And it was not only his own misfortunes that preyed upon his mind and kept him constantly 'both in body and mind in a state of fever'.(45) He was consumed with remorse for the troubles he had brought upon his friends. In one of the last letters of those dark days he writes: 'I have suffered so much in consequence of the losses you and some of my other friends have sustained in these Colonies as almost to have broken me down. My own losses have been very heavy, but my own misfortunes do not bear upon me, nor do they give me so much concern, as what you and others have suffered'.(46)

Although, as early as 1844, Swanston could read well enought the writing on the wall, he was determined to delay as long as possible the final day of reckoning, and for the next five years he strove to keep the tottering fabric on its feet. He made frantic attempts to realise his own assets, and those of the Bank, and his last letter book is full of efforts to enforce payment of overdue bills and mortgages, accompanied by threats of foreclosure or legal proceedings, if his demands were not complied with. The crowning humiliation came when he had to go to the Bank of Australasia and the Union Bank for financial help. This must have been particularly galling to a man of his temperament.

In 1846 the Bank's premises in Macquarie Street, were sold to the Union Bank, and the Derwent Bank moved into the building adjoining (now part of the Tasmanian Club).[47] It was essential, of course, that no hint of the Bank's precarious position should get out to the public. This is probably the reason for the mysterious letter which he writes to Edward Dumaresq, saying: 'There is not a word of truth in the reports you have heard.',[48] and for his request to the Colonial secretary that the Bank's quarterly return should not be published.[49] . . .

But the tide was now flowing too swiftly to be stemmed.

In July, 1848, the Bank's half-yearly dividend fell to 3½ per cent, and in the following January no dividend at all was paid.[50] In April a circular was issued, calling up all overdrafts and refusing all further accommodation.[51]

Then came the *coup de grace*—the Bank of Australasia and the Union Bank declined to grant further assistance.

After this, events moved fast. On 27th September, 1849, Swanston resigned, and at a meeting of the shareholders it was resolved to wind up the Bank, and Mr John Walker was appointed managing director, with power to carry out the liquidation.

On 26th October a circular was sent out notifying debtors of the Bank that all amounts owing must be paid within six months.[52]

Shortly afterwards Swanston assigned the whole of his estate in trust for his creditors, and set sail for America, leaving behind him debts aggregating £106,000 (£50,000 of which were owing to the Bank), and assets valued at less than half that amount.[53]

He did not survive his downfall for long. After a brief stay in California he started back for Australia, and a few days afterwards—on 5th September, 1850—he died on board the vessel, and was buried at sea.[54]

Victoria perpetuates his memory by the street in Melbourne which bears his name. In Tasmania the only memorial is Swanston-street at New Town.

We may say of him, as was said by Samuel Johnson of a greater man:

> " He left the name, at which the world grew pale,
> To point a moral, or adorn a tale."
>
> (Vanity of Human Wishes)

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Some Scientific Factors of Linguistic Change

By

L. A. TRIEBEL

(Read 2nd November, 1948)

One of our Vice-Chancellors recently said that the first proud duty of a university is to be the trustee of the intellectual and cultural heritage of mankind and to strive for cultural continuity in a world of rapid change.

It falls to linguists to consider the most important means by which our human heritage is shared and communicated—speech. In any study of man as a social being, speech is a central point from which radiate many forces and problems.

In the development of speech there are two basic factors—physiological equipment and the beginnings of social organisation. Sounds are perceived by a rapid rhythmical series of pressures on the ear-drum and speech sounds are produced by the vocal apparatus, flexible membranes in the larynx being capable of vibrating in a column of air whilst other organs form variable resonating cavities.

The origin of sound symbols has been seen in primitive speech symbols used in emotional situations—*O* for fear; *Ah*! for joy; *EE* for pain, and others. Paget, however, with a tongue-gesture theory, violated the time-scale when he identified the *i (ee)* sound with the idea of smallness and the *a*, ə and *u* sounds with largeness or distance.

Our subject holds a challenge—are languages as clearly the product of evolution as is man himself?

At the outset it is necessy to distinguish sound from phoneme and both from their graphic representations. The sound is absolute, the fixed quantity of a physiological and acoustic nature; the phoneme is relative, the result of historical evolution, and may have shadings dependent on the nature of neighbouring sounds (*cf.*, the *k* of *key* and *cool* or the *l* in French *lac* and *peuple*). Again, the vowel element in *bone* is a phoneme probably once sounded *a*:, the present pronunciation varying between ə*u* and *o*.

The story of the Tower of Babel is moral allegory. Many languages are as clearly the product of evolution as is man or any other organism. For about 3000 years, evolution can be seen as the central fact in some recorded languages—wonderful to observe. There are, however, still hundreds of unwritten languages on the globe and even within a comparatively small area there are scores of entirely unrelated languages.

Languages do evolve and change continuously; *e.g.*, Latin lives on in Italian, in essentials just spoken Latin grown older, although, of course, many new words have been borrowed from neighbours. Spanish, Portuguese, French and Roumanian are other sub-divisions of Vulgar Latin. By going farther back, we see that Latin, Greek, Celtic, Germanic and Slavic were all, in say 1500 B.C., blood-brothers with a common parent-language, the Indo-European, which itself soon divided into two main groups, the *centum*- and *satem*-languages, according as the Proto-Indo-European guttural K is represented by a guttural or by a sibilant. Indo-European sub-groups are Indo-Aryan, Armenian, Hellenic, Illyrian, Italian, Celtic, Germanic and Letto-Slavonic.

There are more families of languages, those to which, *e.g.*, belong Chinese, Turkish and Eskimo. Four main types of linguistic families are known. First, there are the isolating (tone) languages, mainly monosyllabic, with no inflections or parts of speech. Colloquial Chinese has only about 500 different root words, monosyllables; but by intoning each syllable differently, the Chinese achieve a vocabulary of over 2000 words.

A second family is composed of agglutinative languages; among them are Turkish, Finnish and Magyar. Their basic principle is the use of affixes, before and behind, in themselves not meaningless and incapable of standing alone as, *e.g.*, in *be-fog(g)-ed,* but themselves individual words capable of being glued together into larger ones as in our *longshoreman.*

A third major group consists of inflectional or amalgamating languages, in which words are constructed by the addition (to the root) of one or more prefixes and/or of one or more suffixes, such additions not being themselves recognisable words, *e.g.*, *re-cooked.* Moreover, prefix, root or suffix, one or more may be internally modified, *e.g.*, French *apporter*, with assimilation of the prefix *ad-*.

The largest of all language families, the Indo-European, is inflectional and its speakers embrace about one-third of mankind. Latin, English and Hebrew are examples of widely differing sub-types; thus Latin is more inflectional and less analytical than modern English which expresses many syntactical relations by independent words. Apart from the Indo-European, the other chief families of this type are the Semitic, like Hebrew and Arabic, and the Hamitic, *e.g.*, Egyptian.

The fourth type of language family is polysynthetic or holophrastic (= phrase-as-a-whole) in which sentence or connected thought becomes one complex word and the most significant sounds of each ingredient are welded into a compact mass. This technique is evident in native American languages, *e.g.*, in Cherokee, where *nadholinin* (bring us the boat) is made up from the basic *naten* (bring); *amokhol* (boat) and *nin* (us).

Few languages, however, belong exclusively to one type, and some partake of the salient features of two or more types. Australian aboriginal tongues are all complex. Basque is a mixture of agglutination and polysynthesis. But European languages, with the major exceptions of Basque, Finnish and Hungarian, are descended from Indo-European, perhaps first spoken along the Danube. Its dialectal forms spread over Europe and much of Asia. Change may have operated swifty and offshoots of the mother-tongue rapidly become mutually unintelligible.

The original Indo-Europeans left no written records; but by deduction from observed facts of present-day and older recorded languages, philologists have re-created Indo-European. Students of Sanskrit (= 'perfectly written') a very old Indian language, discovered close correspondences in vocabulary and grammar between Sanskrit on the one hand and Greek and Latin on the other. When the Germanic and Slavonic tongues were also compared, the resemblances were found to be too consistent to be accidental and the farther back one went the closer became the resemblances. So sure were the lines of convergence, that from examining a word or structure in one language, a corresponding word, form or construction could often be predicted and found in another language of the family. The small differences in one Indo-European language from another are apparent from the following equivalents and resulted from discovered spontaneous changes or 'laws' which often have practical value in determining the meaning of words:—

GREEK	LATIN	ENGLISH	FRENCH	GERMAN
frater	frater	brother	frère	Bruder
treis	tres	three	trois	drei
pod	ped	foot	pied	Fuss

The difference between, say, *pod* and *foot* (p > f) is only apparently great and was subject to the consonantal change known as Grimm's Law. Such laws are statements of accredited changes classified on the basis of time and spatial relationships and admit of no exceptions.

The story of the original Indo-Europeans, who probably called themselves *Wiros* (Lat. *vires*) may be deduced with reasonable certainty. Their language was highly inflectional and their nature urged them to expansion. In each of the languages descended from Indo-European there occur words obviously identical for certain objects and actions—hence it is deduced that the parent language knew those things, animals or actions, *e.g.*, wolves. The horse, ox, sheep, pig, hound, wheeled wagons, yokes, mead, copper and barley are other examples. They had words for water-borne vessels, the sea or a lake, and for the normal family relationships. Their religion was polytheistic and they migrated in waves. After leaving the mother-nation, each group gradually developed dialectal peculiarities like Celtic, Teutonic and Italic, which in time again sub-divided.

Divergence was accelerated by lack of intercourse, absorption in foreign tribes and the absence of records to act as brakes on unrestricted changes. Recently in Turkestan, a dead city of a long-forgotten people was unearthed. Tablets with writings were found and read easily; the language of this former Asiatic race was in essentials almost identical with the present-day Irish language. The linguistic effects of invasion can of course be illustrated from the history of England. Now the spread of literacy, like wireless, does restrain the growth of dialects. English itself has during the last 300 years split only into a few main new forms, like Standard English, Pidgin and American.

There is no necessary correlation of race and language. Many European languages are fast disappearing through the competition of stronger neighbours. Cornish has gone; Gaelic, Breton and Welsh are dwindling; the German Wends (Slavs) have, I think, lost their language. In Ireland, Erse has been artificially revived; in the U.S.S.R., encouragement is given to languages like Ukrainian and the Caucasian tongues. The ups-and-downs of a language do not always reflect changes in racial groupings; thus the racially identical negroes of the United States and of Haiti speak English and French as their respective native tongues. The ancient Iberian race survives in the stock of English, French and Spanish peoples; but only Basque remains as an Iberian language.

As a rule, national unity of fusing races has been most fully achieved where linguistic minorities have *not* persisted. In Great Britain the price of unity has been the surrender of private idiom; we may perhaps note a contrast with India. In the sphere of government and in *esprit de corps*, a language barrier is an obstacle to fraternisation and to cultural activities, as in literature which, in a broad sense, is the vehicle of tradition. Henry Ford expressed the opinion that Europe needs about fifty more dead languages.

Linguistic and cultural fusion has often been an easy process. Caesar conquered Gaul and the country was romanised within a few centuries; a civilisation which absorbed the Frankish invaders. Celtic and Frankish contributions to Romance speech were small; but the racial mixture of the French remained with later Northman additions. Celts and Franks were intelligent mixers.

Chinese is an isolating language; Japanese, mainly agglutinative, is more complex. Such a linguistic gulf made Japan's 'Co-prosperity Policy' rather unreal.

There are linguistic oddities and antagonisms. In Norway, educated people prefer a form of Danish to Norwegian. The Prussians were Slavonic invaders speaking Old Prussian, having affinities with Russian; a heavy blow to Nazi pride. There is Afrikaans in South Africa as a rival to English; but speakers of both

languages are outnumbered by natives having Bantu dialects. Franco in Spain suppressed linguistic minorities. The Roman rule in many countries was, however, tolerant of indigenous cultures; Rome was prepared to adapt the native material to the peaceful, prosperous ends of government: especially in France, Italy, Roumania and Spain. Latin became the international language of churchmen, scientists and scholars. Switzerland is nationally fused, with four languages; external pressure has operated here in solving minority problems. But in spite of Palestine's central position on the old trade routes, the Jews preserved their language by internal cohesion.

So far, it has been implied that culture and language are casually related. By culture we mean the set of ideas, and the activities based on ideas, shared by a given group of human beings and transmitted. Thus the culture of Australia is in essentials British.—Now does culture reflect a language or does language reflect a culture, or is there no casual connection between them?

Those taking the third view point out that great civilisations have been developed by the Chinese, speaking an isolating tongue, by the Aztecs of Mexico (holophrastic), the Arabs of the great age of Islam (part-inflectional), and by the ancient Greeks (highly inflectional). Yet all these cultures differ and there is no evidence to show that Greek culture could have developed in Mexico or Mexican culture in Greece.

It is difficult to say to what extent a culture depends on a language; but a culture that makes much of abstract ideas must have a language in which these are adequately voiced. This is possible in all four language types, *e.g.*, Chinese renders the idea 'Man's nature is fundamentally noble' as 'man root good'. Yet some people may feel that an inflectional language is the best vehicle for debating subjects like metaphysics or mathematics; however, analytical languages like English and Chinese do permit a high level of abstraction.

What appears less controversial is that a culture is expressed in perfect naturalness only in the language of those who have that culture. The Romans, *e.g.*, were never quite at home with Greek philosophical ideas; their genius was more practical.

Again, there is a difference in the expression in three idioms of the same basic idea: Liberté, égalité, fraternité; Government of the people, by the people, for the people; Democracy. They are translations, each of the other; but are there no differences?

The culture of Australians is easily expressed in English; but the native tongues of Australia have often no possible means of translating many of our ideas. It would be almost impossible for the Old School Tie to be in the least real to some tribes. Such phrases (and all languages have many similar emotional examples) cannot be translated without adding to or subtracting from the meaning. The culture of another group is acquired only with difficulty by those to whom that language remains foreign.

It was once held that primitive peoples had a very small vocabulary. Facts do not allow such a generalisation. Max Müller stated that an illiterate farm-labourer of the last century used scarcely more than 300 words for all purposes; but observers disagreed about what constitutes a separate word. Now the *Oxford English Dictionary*, as my colleague, Mr. Harwood, pointed out, has about 240,000 main entries; but the normal adult speaker probably knows about 30,000 words and uses only some 10,000. A child of 3 to 4 commonly has a vocabulary of 600-700 words. Shakespeare used 24,000 words; the Authorised Version only 7200. Zulu has 1700 words; Dakota (American Indian) 19,000 and Navaho 11,000. Hence size of vocabulary cannot be considered to be a reliable index of cultural potentiality. Moreover, from a comparative examination of literatures, it is not always possible

to say that one language is, as a linguistic instrument, more adaptable to literature than is another.—Regarding form, there is no mechanical reason why any speech adequate for human intercourse cannot also be adequate to the recording of that intercourse. Literature is often based on a small vocabulary and the judgment of the form of expression is dependent on fashions in taste. In any case, poetry exists prior to writing.

Language, culture and literature seem to depend on a similar set of human faculties and on biological environment. The main instrument for the transmission of a culture is language, man's exclusive property.

By natural, gradual changes Indo-European has produced languages so far apart as English and Irish. Very few people in that time were aware of change. Each of us, however unconscious of the fact, shares in the process. We do not usually look back to our early years when we spoke differently from now. Phoneticians detect minute variations which in a short time produce a varying pronunciation. Change in speech is most rapid in the youngest of co-existing generations and most new fashions in words remain unnoticed by elders. Shakespeare's grammar was much like ours; but his pronunciation would be somewhat unintelligible to modern ears, unless, as my colleague, Mr. Harwood, reminded me, the diphthongisation of the Old English long vowels had been completed in Shakespeare's day and dialect.

One offshoot of the Indo-European race spoke Germanic which itself split into the West and East Germanic dialects. The chief sub-groups of West Germanic were Old English and Old High German. The relationship is still apparent.

Differences and resemblances can be traced, defined and to some extent explained. The words *heart* and *Herz* will serve in illustration. The initial *h* in both is known to come from Indo-European *kh*, an aspirated stop, which early changed to the spirant χ (chi) later simplified to the aspirate *h*. Latin and its descendant French preserved the palatal stop *k*, as in L. *charta* and Fr. *carte*, from which we get *card*, a late borrowing with changed meaning. But the direct offspring, resulting from the first sound-shift, of *charta* in the two Germanic languages is *heart* and *Herz*, as are *hound* and *Hund from* L. *canis*. Other early sound-shifts were I.-E. *bh*, *dh*, *gh* > Germanic *b*, *d*, *g*; *p (h)* > *f*; *th* > *t*; and *b* > *p*, *d* > *t*, *g* > *k*. Hence we expect the *p* of L. *pater* to become the *f* of *father*, and the *d* of Greek *deka* and L. *decem* to be the *t* of *ten*. Even the apparent exceptions of the I.-E. sound-shifts have been codified as Verner's Law and shown to depend on 'accent protection'; or to be later borrowings from Latin and Greek. Close linguistic relationship is again shown by *brother*, once identical with I.-E. *bhrátar* (L. *frater*); but early Germanic in certain circumstances changed original *t* to *th*, and original *bh* to *b*, whilst Latin preserved *t*, and changed the 'graphy' *bh* to *f*.—The difference in accentuation between *posséss* and *póssible*, *e.g.*, is explicable only in the light of the shifting I.-E. system of stress.

Some apparent violations of phonetic correspondences have been found to depend on secondary factors like dissimilation, the time element and, above all, as Verner discovered, stress. Thus we would expect for I.-E. *t* as A.S. θ and Ge. *d* (*cf.*, the ancestry of *three*); but contrast the cognates of Sanskrit *bhrátar* with those of *pitár*; in the latter case, only E. *father* is regular. When the chief accent immediately preceded the unvoiced stop, it changed to a spirant; when the main stress followed, a voiced sound resulted; *cf.*, *póssible* and *posséss*. Verner's law helps us to determine the position of the accent in I.-E. words, as variable as in Greek. Germanic stressed the root syllable. Variations of stress and pitch are factors of national speech melodies and have, as in the work of Armstrong and

Constenoble for French, revealed a wide range of significant patterns. Free accentuation for emphasis, or for emotional and oratorical purposes, is a recognised factor in speech.

In the early centuries of our era, further consonantal changes, grouped as the second sound-shift, occurred. These coincided with the expansion South and South-East of the Germanic peoples who split into Low and High German. English and Dutch remained on the older stage and successfully resisted, *e.g.*, the High German shifts of the stops, *p, t, k* to the affricates (stop + spirant) *pf, ts* (z), *k* χ (ch); or, after a short vowel, to the aspirants *f, z (s), h (ch)* (O.E. *ic* > *ich*). Later often *d* > *t* and *þ (th)* > *d*. Thus the German shifts of *p* to *f (f)* and of *t* to *z* in *ship, Schiff* and *heart, Herz* are regular second sound-shifts.

Linguistics aims at defining universal categories of speech phenomena and the factors on which these depend. But there are also non-universal categories and somewhat unsystematic diachronic (+ synchronistic) speech phenomena which are in danger of being overlooked by tabulators of sound-shifts, *e.g.*, some in Armenian and in modern Danish (*cf.*, 'Lingua', I, 1). Yet the general principle is clear—'La linguistique aboutit à des formules du type "si . . . toujours et partout", énonçant entre les faits des rapports conditionellement nécessaires, donc à des lois semblables à celles des sciences exactes + la tâche prochaine . . . sera d'établir un aussi grand nombre de ces lois'.—And these 'laws' are often laws of 'passage', *e.g.*, the Fr. change between the 5th and 8th centuries of *c (k)* + *a* > *tch*, which later > *ch*. The mark of consonantal change is the reversal of the positive and negative terms of the original opposition, a reversal due to an enlargement or diminution of the regions where they are in use. Danish *b, d, g* have recently lost their voice and, after *s* especially, *p, t, k* are softened *(skrive > sgrive)*, a reversal of two series of stops which sheds light on some earlier changes. Further, physiological and social factors are insufficient to account for such changes, but other sound-shifts are illuminating. In French, the tendency to approximate *brun* to *brin* and to make *joli* > *ʒœli* might be noted here.

From the Roman invasion to the Norman conquest, Celts, Romans, Angles, Saxons, Jutes, Danes and Norman-French left linguistic traces in Britain. English has changed greatly; its vocabulary has been enriched by borrowings. A language meets changing conditions and varying needs. The wear and tear to which as an instrument it is subject implies change and addition in vocabulary, together with shifting meanings and functions. By the 13th century, however, our language begins to look modern:—

Sumer is i-cumen in;
Lhude sing, cucu . . .

On passing to Chaucer, we notice that many new foreign, chiefly Latin and French, words have crept in, like April, March, pierce, virtue, engender, flower, pilgrimage and strange. Most end-syllables and cumbersome inflexions have dropped off since; but foreign borrowing has increased. Grammar has simplified, yet the old basic vocabulary has remained and we are speakers or writers of good English in our sincerest moments when we say—'I love you dearly' rather than 'I entertain for you a profound affection'.

Languages do change without interference from outside, yet external factors periodically play their part. The coming of the Danes helped to fret away the cumbersome Old English endings and many Danish names were adopted. The Normans in England used their Northern French as the official tongue for about two centuries. The bulk of the English people used only such French words as became needful in their dealings with the master-class. The opening chapter of

Scott's *Ivanhoe* sheds light on that linguistic position until in the end the Normans, like the Danes, adopted English. Sometimes the native word was excluded by the newcomer, *e.g.*, *despair* ousted the *wanhope*; or else the French established itself beside the English in such pairs as *royal* and *kingly*; or the Danish *hale* by the side of whole. Such neologisms built up an astoundingly large vocabulary of near-synonyms making possible delicate shades of meaning. Once the path was blazed the word-invasion grew and it has never ceased. The scientist, needing a new term, has had recourse to dog-Latin or Greek or French forms: instead of *far-talker*, he chose *telephone*.

In addition to such broad movements as growth in vocabulary and simplification of grammar, common to many languages, it is clear that everywhere there persists a movement towards standard speech, arising from the medley of dialects. In France *le Francien*, the speech of Paris and its environment, gradually prevailed; standard English emerged in the fifteenth century. In centres of government and trade or learning, such as Paris, London and Oxford, the mixing of speakers of various dialects produced a blend which continues to spread; printing, popular education, the press and broadcasting are forces acting in the direction of making standard speech less and less a class dialect. By 1660, both English and French *grammar* were practically standardised: it was the century of the Authorised Version and of the French Academy, as well as an age of political centralisation. Many once purely dialectal forms went over into the standard language: French, *e.g.*, absorbed the Provençal *amour*, the Eastern dialectal *oie*, for *oue*, the Picard *caboche* ('nut'), the Norman *benêt*, and Breton *crevette*; English absorbed some Norman-Picard-French forms with the initial unshifted *ka (ca)* and *ga*, like *carpenter* and *garden*, as distinct from Central *charpentier* and *jardin*. Both English and French took *dupe* from argot (thieves' slang). To *poll*, go to the *poll* and *poll-*(tax) came from twelfth-century Picard-French *pules* (folk, people). Contrariwise, the Devon and Cornish *youm* (you am = you're) has gone into nautical French in the sense of a British sailor or any Briton.

Often the treatment of borrowed words is a challenge, for one must take into account pronunciation at the time of borrowing, manner of transmission and the peregrinations of the newcomer. Sounds foreign to a language are rendered by near equivalents; thus French importations like *bifteck*, *rosbif*, *paquebot*, *redingote* (< riding-coat), *beaucuit* (< buckwheat), *contredanse* (< country-dance) and *le fifocloque* are phonetically naturalised and to some extent associated with known words. Modern French with its tense 'dégagé' final vowels, reduced diphthongs. Popular etymology is ever active, *cf.*, E. *grog* (< the *gros grain* clothing worn by Admiral Vernon); Fr. *le jeu de l'âne sale* (game of Aunt Sally); Ge. *Maulwurf* (< *moltwerfe* = earth-thrower; (*cf.*, *mole* and *mould*).

One-word histories often reveal startling changes in meaning. Latin *caput* (head) became Italian *capo*, later extended to *cappochia* which gives French *caboche* (slang = 'nut') and this was borrowed in Middle English and became *cabbage*. A *milliner* was a *Milan-er* when Milan was the centre of fashion.

Some words are based on personal names perpetuating the fame of men and women who never expected to be immortalised. The simple *derrick* (type of crane) is so named after Alan Derrick, a flourishing hangman of Queen Elizabeth's time who plied his trade on Tyburn. The fourth Earl of Sandwich solved the problem of solid refreshment during his long hours at Brook's gaming tables by ordering slices of meat to be served between rounds of toast; so he christened the sandwich. In 1880, Parnell advocated social ex-communication for those who dealt in Irish estate; his first victim was a Captain Boycott; he gave a word to many languages.

Bloomers are a tribute to an American lady, Mrs. Bloomer, who introduced a trouser-like garment, designed to reach below the ankles, in the interest of modesty. The word *doily* commemorates the business acumen of Edward Doyley, a mercer in the Strand. His speciality was 'dainty and cunning table-mats', chiefly imported from France, and the public honoured them with his name. The term *martinet* resulted from the stern discipline of a General Martinet of Louis XVI's reign.

In 1759, France was finding difficulty in balancing her budget. Following the reckless Scot, John Law, a new Controller-General, Etienne de Silhouette, instead of attacking the extravagence of Court and nobles, indulged merely in a few petty economies. Among other measures, he decided that portraits in oils were too expensive, and he invented a new, cheap method of portraiture. The fashion was a passing craze; but a word was added to many languages—the *silhouette.*

Such linguistic additions are obvious; but what further factors cause changes in pronunciation? These can usually be traced and explained; but a knowledge of phonetics and of the vocal organs is necessary. First, the chances of repeating or imitating at will *exactly* any sound are small indeed; there is Imperfect Auditional Imitation.—The tongue and lips alone are fairly bulky and their movement cannot be governed to a hair's breath. We can, however, aim at a given position of the organs, but the phonetician is sure of the exact target; its area is easily misplaced. In individuals and communities, many misses gradually alter our vague notion of the target and in a generation or two this cumulative displacement produces marked changes. Yet it is likely that laziness, economy of effort in speech, is the greatest factor of such changes. An example; how do many people tend to say *git* for *get*? Because *i* is made further forward in the mouth than *e*, and in passing from the back position for palatal *g* to the front one for the dental *t*, the tongue tends to over-run the *e* position in anticipation of the *t*. So the back *l* in Old French *chevals* was vocalised by the back vowel *a* to form the *o* sound of *(chev) aux*. There is much assimilation in spoken languages. Sometimes, however, dissimilation operates; the desire to avoid too close repetition of a sound, as in French *orphelin* (< Vulgar Latin *orfaninu*).

The results of imperfect auditional imitation and of economy of effort are familiar. These and other factors, like new contacts or geographical isolation, are vital in the attempt to rationalise speech changes.

It is therefore pertinent to analyse some recognised phonological features in the light of such factors.—Can we, *e.g.*, apply the *lex inertiae* to the common processes of monophthongisation and diphthongisation, vowel mutation and gradation, glide sounds, assimilation and dissimilation, palatalisation and metathesis?

Such changes are due mainly to a speaker's normal use of the minimum of energy needed to convey meaning; they are facilitating devices.—What of diphthongisation from this point of view?—In English, both it and monophthongisation are active tendencies, if unconscious operations (cf., the pronunciations of *game*). Acoustically, vowel qualities depend on varying combinations of overtones with the fundamental note, modified by the shape of the resonant cavity which itself may be influenced by a neighbouring sound. So the change to a 'darkened' vowel in *was* is due to the bilabial consonant, whilst 'open' French vowels may result from the nature of the following consonant, just as *ʒœli* for *joli* exemplifies mutation or palatalisation under the influence of the final *i*.

A dipththong is two vowels of differing sonority, one merging into a closer one. The dipthongisation of long vowels *(min > mine)* in which stress may be a factor, has physical and psychological causes. It is difficult to keep our speech organs

in one position for a long sound without our thoughts running ahead to the next and we are apt to introduce qualitative variations in order to produce an easy rhythmical curve.

Again, a new vowel may result from the vocalisation of a consonant, or a glide may develop between vowel and consonant (dial. *miulk*). Vulgar Latin reduced old diphthongs while it developed new ones *(audire > odire > oire > oyer ouir)*. Whereas English had passed through cycles of dipthongisation and monophthongisation, French is now stable in this respect *(aqua > ewe > ϵ a U > ϵ U > ϵ o > o)*. Reduction seems to be gaining ground in English (*cf.*, *game* > gϵm; tower > t a). These are economies of speech. Dialect geography has delimited many variations.

Assimilation and dissimilation are also speech facilitations or adjustments. Regressive assimilation is heard in *blaegb* ∂ *:d* and Fr. *chambre* (< *camera* > tchāmbr > shā:br) > tʃāmbr > ʃā:br where the velum was lowered for *m* and rose to *r* before the lips left the *m* position and the release of the lips produced the *b* glide. Dissimilation avoids monotony (Fr. *marbre*, E. *marble*; L. *flebilis*, Fr. *faible*). In V.L., the prosthetic *e (i)* evolved as a glide before *s* + consonant whenever the preceding word ended in a consonant *(scola > iscola > escole > école)*. A somewhat sporadic speech facilitation is termed metathesis, the interchange of phonemes within a word (L. *parabola* > Spanish *palabra*).

Palatalisation is an assimilative change caused by a neighbouring front sound like yod. The articulation is modified by pressing the tongue upward against the hard palate (Fr. *fille*, *enseigne*). French evolved a palatalised *Kj* all the way to an *s* (V.L. **cjelo* > *ciel*). Norman and Picard dialects, however, resisted the palatalisation of *Ka* and *ga* to *ch* ʃ and ʒ, and those dialects gave English forms like *castle*, *garden*. A front vowel can palatalise various neighbouring sounds *(rubĕus > rouge)*. Vocalisation of a consonant between vowels is another type of assimilation (L. *vita* > *vida* > *vitha* > *vie*).

—What of the vowel mutation termed *Umlaut*, and *Ablaut* or vowel gradation?

English, as distinct from German, has few surviving *Umlaut* forms *(mouse, mice)*. These are vowel assimilations (Ge. *Haus*, *Häuser* < *hūsir*) by which a back vowel is approximated to a following front vowel by an anticipatory tongue movement, another speech facilitation.

The Indo-European vowel change known as gradation is preserved, *e.g.*, in the root forms of 66 English strong verbs and in other Germanic languages. The desire for uniformity is apparent in the increased weak conjugation and in a child's analogical formation like *telled* for strong-weak *told*.

Gray showed that qualitative vowel gradations first concerned the alternation of *e* and *o* (Greek *légo*, *lógos*) the former originally unaccented (L. *tego*, *toga*). Such qualitative alternation was most likely due to stress or its absence and soon acquired useful differences of aspect, the *e* grade being imperfective and that with *o* perfective. I know of no other explanation, although in some languages, like O. Persian, *Ablaut* was perhaps due to the same cause as *Umlaut*. The origin of the weak verbal dental endings is seen in early forms like O.E. *andswerian* + *dyde* > *answerede*. In Romance languages, stress and rhythm gave vowel variations of the *viens*, *venons* type.

In preserving speech forms and syntactical usage, the written language is of course a powerful stabilising factor. I can say little here of grammatical change or of the vital rôle of analogy in speech and writing, so well treated by Bloomfield. But it is indubitable that the ear, rather than the eye, is most concerned in speech changes.

In semantic development, the fertilising factor of metaphor and other figures of speech is apparent. Secondary meanings grow out of primary significant forms and vastly increase their range (*cf.*, the extensive idiomatic uses of *foot* and *hand*).

Sound-change is sometimes more easily traced than change in meaning. Various factors, including aural or visual analogy, and sometimes pure chance, may be involved in semantic change. One element may predominate in a name which is then restricted to that element, *e.g.*, *deer* once meant any animal (= German *Tier*). Or a secondary meaning displaces a primary; *villain* originally meant *serf*. Euphemism also brings changes, as when *stomach* substitutes for *belly*. Lack of understanding and the desire for emphasis produce other semantic developments, e.g., '*awfully* pretty'.

Word-shortening accounts for *mob* (< Latin *vulgus mobile*, fickle crowd); cab (riolet); miss (tress); (hi) story; French *un vapeur* (< *bateau à vapeur*), etc. Moreover, in rapid speech, words are run together to form sense breath groups; a telescopic process. Yet it seems likely that changes in meaning, sound and grammatical form, will be slowed down by universal education and radio; such factors tend to set up widespread standards gradually ousting dialects, at any rate in the regional sense; yet with modern transport and population-changes, occupational and group idioms persist.

One source of dialect is the influence of migrants, as in the Northern dialects of England which owed much to Danish infusion; but dialects may develop in communities free from foreign intermixture. Phonetic aberrations of an individual due to a speech defect, may spread, as may the vocabulary of a regional, social or occupational group with wide internal intercourse in countries having no physical barriers. There is, however, the tendency for the norm to assert itself continually.

All things flow. This then holds true of grammar. Like the French Academy in its dictionary, the linguist records and analyses observed, heard facts; *on dit* . . . He states the changes determining fashion; he does not legislate for the future. Grammatical rules are relative; once *him* was only a dative case which regularly gave the dialectal or slang *'un*. Fetishes like the rule that a preposition should never be used to end a sentence with and the ban on *all* split infinitives imply a worship of dead ghosts. In spite of the pedants, 'he *dared* not go' has ousted *durst* and there seems no good reason why the gardener should not cut his *gladioluses* and catch his *buses*.

Commonsense gives us little leave to legislate: our function is to record observed facts. Perhaps a safe rule is found in the tag:—

'Be not the first by whom the new is tried,
Nor yet the last to cast the old aside'.

Spelling is in some languages outrageous. Reformers are aghast to see that *fish* could, if we adopt the spelling of the *f*, *i*, and *sh* sounds in *enough*, *women* and *nation* respectively, be written *ghoti*. One letter may stand for more than one sound; one sound may be differently represented; there are silent letters; one sound is represented by two letters, and two or more sounds are rendered by one letter.—But would spelling reform on a phonetic basis result in economy of effort in reading? American practice has moved slightly in this direction and the International Phonetic Association invented an alphabet having an unvarying single sign for each sound and it is used by scientific linguists everywhere for recording. Only by such an alphabet can the differing pronunciations of identical words be accurately transcribed (*cf.*, D. Jones's *English Pronouncing Dictionary*). New evolving sounds are given new symbols. Admittedly, phonetic spelling would involve a break with sentimental traditions and the practical difficulties of its

full adoption appear almost insurmountable. But any alphabet is more or less an invention. Modern language teaching begins with sounds and transcribes them in the symbols of the International Phonetic Association, *e.g.*, the French pure vowel *o* is so written and only later are its orthodox 'graphies' *o*, *au*, *eau*, *ot*, etc., discovered by the learner. This is an easy process.

Speech is a motor activity of tongue, mouth and throat; our speech-movements are controlled from the appropriate motor centres of the cortex, although these are not as clearly defined as the visual, auditory, motor and olfactory centres on the brain. Language is not, like eating and walking, an inherited biological activity; it is acquired. Eliminate society and there is no speech; change the society and you change a child's speech. Instinctive groans and cries are not speech.

To the psychologist, speech is primarily an auditory function. Communication by gesture or writing is a substitute for the direct communication of sound-groups to the auditory receiving apparatus. Only seldom does writing or spelling affect speech, as, *e.g.*, when the *h* sound came back into *hotel*, or when Americans say *schedule* (? on the analogy of *scheme*).

The nervous system is normally adequate to produce changes in speech: the neurones of the cortex make possible almost unlimited patternings and combinations or association paths. The act of talking involves at least five brain tracts; but the product of this process and ever-shifting adjusting network must be mentally associated with some element of experience. This is the meaning, agreeing with an identical association in other minds. Words become symbols of concepts.

The problem as to whether thought is dependent on speech has often been raised. Some investigators hold that thought is impossible except on the substratum of words. Yet words, although not consciously framed or spoken, may exist as mental processes without vocal expression. Another school holds that thought deals in images—remnants of sensations—and *may* then be translated into language. Pillsbury compromised: thought might be of both origins. Thus thought in images is probable in musical composition; but thought is based on words when the subject-matter is abstract. Language is an instrument put to use on both the lower and the conceptual planes—the instrument makes possible the product and this in turn refines the instrument. The growth of speech is, however, generally dependent on the development of thought. Experiment and introspection may solve the problem of 'inner speech'.

In our discussion on linguistic changes, the vitalistic theory of evolution has been implied; a theory holding that evolution is a process whereby the life-force of the universe, immanent in all matter, fulfils itself purposefully in new patternings. Whilst the vitalist does not suggest that there are no scientific laws, such a vital principle is opposed to the mechanistic theory that evolution is due to unchanging scientific laws which are *all* physical. Even on the plane of plant life, a degree of individuality and freedom appears. In animal life there emerges a greater power of self-locomotion, as well as the phenomena of mind and purposive if inarticulate language, but with not much conventional meaning. Yet an African Bushman's child can by education reach a standard of understanding for abstractions and time and space relations impossible to the higher apes. Man can by word symbols differentiate the facts of the physical world.

—How shall we then conceive the emergence of language and what were its original features? These are questions under consideration, involving the monogenesis or the polygenesis of languages. Investigation is busy here.

The *bow-wow* theory of animal imitation cannot account for most verbs, the prepositions and nouns symbolising noiseless objects; moreover, it assumes that language originally had our word-units. These objections are valid also against the interjectional *(pooh-pooh)* theory that all speech arose from emotional cries of pain, pleasure and wonder. But we have outgrown the *wacko!* stage. Nor did the *ding-dong* ('ringing sound') theory hold; the sounds of external nature are too limited to serve as a basis. On the other hand, the *ye-he-ho!* theory argues that bodily activities call muscular tensions into play, some of which affect chest, throat and mouth, and produce, by intake and expulsion of breath, a sound characterising the particular bodily activity—say *heave, haul* and *yum yum*. Yet only a very small fraction of speech can thus be accounted for. There is also a kernel of truth in Paget's *tongue-gesture* theory relying on our habit of moving the tongue or lips in sympathy with movements or ideas to which attention is directed. In the mute gesture-language of the Amerindians the tongue is used for positional and spatial reference. Such tongue-and-lip movements during the expulsion of breath produce sounds typical of each movement. Thus the raising of the tongue-tip to the roof of the mouth produces *al, oll,* or *ull* sounds, in some languages associated with height, *e.g.*, Latin *alt-*; *Alps, Atlas, Urals, Nepal*, etc. Many of Paget's examples are over-fanciful, and his theory cannot be held to reveal the whole truth.

Scientific investigation has here followed three main lines: animal 'speech'; child-speech; and the study of extant linguistic records going back nearly 4000 years, together with the examination of the speech of existing primitive peoples. In spite of the ability of 'talking' birds, nothing of a helpful nature has been elicited. The gap between primitive human speech and the sounds of the higher animals defeats rational analysis.

An Indian prince once isolated some infants for several years and kept them from contact with outside speech, his aim being to discover the natural language of man. On examining the children he found that they made uncouth random noises. Our own children are, however, not allowed to repeat the slow processes of linguistic evolution; from the outset a highly evolved language is forced on the infant. By repetition and association, adults form the babe's scarcely determinable inarticulations in conformity with current speech. Later the child struggles to associate concept with verbal symbol and to differentiate the functions of words.

A fruitful enquiry is the historical investigation into the development of recorded languages and those of primitive peoples, far as even these have moved from their origins. It has been found, *e.g.*, that the original forms of many languages had 'speech-units' or words much longer than those in general use to-day. Musical tone or pitch probably once played a great part in most languages, although pitch-differences are still all-important in a minority of tongues, like Chinese, Swedish and Russian. It is likely that originally language and song were, if not identical, at least only vaguely distinguished. Inflexions and other grammatical devices have generally been whittled down with the years; *e.g.*, the synthetic Lation process in *ad-am-av-isse-m* ('begin', 'love', perfect tense sign, subjunctive mood sign, first person singular sign) compared with English analytical 'I would have fallen in love'; but a complex word-structure predominated in some of the oldest languages of the Indo-European group. Some outside this group, *e.g.*, Malay and Chinese, are not so complex; on the other hand, there are highly complex non Indo-European languages for which there is no evidence that they were ever more complex.

The results of investigations lead to the belief that early language was a sing-song, *i.e.*, with varying pitch and stress, often complex, difficult of utterance

and inadequate to the expression of conceptual processes, but marking reactions to emotional stimuli in vaguely strung-together word-sentences. Broadly, for all languages, the evidence is as yet not very conclusive, but more specific findings may result from the comparison of Indo-European with other early languages.

What of future linguistic changes?—Is a universal single language possible or likely? There has been little disagreement on this desirability in removing obstacles to intercourse among peoples. In trade relations, at international conferences, as in the world of scientific research, the conflict of tongues is a disadvantage and one or more international auxiliary languages are called for. Basic English, Pidgin and Esperanto have been formulated. Whereas Esperanto has declined, Pidgin English is the trade vehicle of millions of diverse speakers. Among other auxiliary 'blended' languages in vigorous use at present are Urdu in India, based on a dialect of Hindu; Mandarin Chinese as spoken in most parts of China; Lingua Franca in the Levant; and Sabir (Pidgin French) in West Africa. These have a natural origin. Among the disadvantages of Esperanto are its preponderating Latin vocabulary, the use of many affixes glued on to root words, the accent marks and the monotonously recurring stress on the second-last syllable; as well as many primitive grammatical declensions, agreements and superfluous endings.

Basic English uses certain standard English words, a rigid selection of grammar and the normal spelling. It grew from Ogden's search into the real meaning underlying our frequent woolly use of words. In clarifying meaning, he was led to simplify words and to specify, as Malherbe had done for French. Ogden believed that our necessary communications could be effected with a much smaller vocabulary than that now in common use: such a pruned English of say 850 fundamental words (more than half of them the most frequently occurring words in the language) is far more readily learnt by foreigners than normal English would be and is an admirable auxiliary. Affixes are used in Basic; words already international (telephone, zinc, alcohol, etc.) are retained; and minimum technical vocabularies allowed. It is alive and at times has the noble simplicity of much great literature. This argument does not impair the truth that it is necessary to know more than one language in order to avoid the error of thinking that ideas are expressed by only one set of symbols.

The following is an example of Basic:—'In these days, when the need and the desire for international agreement are equally great, a common tongue is more necessary than ever. It is getting to be more and more clear that this common tongue will have to be English, which is now the language of the governments of many millions and part of the education of every great country'. The step from Basic, admittedly not always the more simple, to standard and universal English is often a short one.

Finally, we must admit that fashions in ethics and conduct often effect changes and contribute, *e.g.*, to the use of 'swear' words, slang, jargon and of inexact, misleading language. Fashion has banned most swear words; some of them are or were intrinsically 'good' words, like 'bloody'. The derivation from 'by-our-Lady' has given way to that from *bloedic* (silly) used as an intensifying adverb, an early Flemish word introduced by English soldiers.

It is, however, not always easy to say what is slang: a word may enter standard speech by to-morrow or it may die a sudden death. Words rise in the scale of respectability, *e.g.*, German *Knècht* (serving man, serf) and *Knight*; or they may acquire a depreciatory meaning, *e.g.*, German *Knabe* (boy) and *knave*. Abbreviations like *phone*, *plane*, *bus* and *zoo* are good in polite speech. Some slang terms are of reputable origin; thus the Australian *deener* (shilling) is Latin *denarius*.

Slang springs mainly from the desire to be vivid and intimate; hence *bloke*, of Romany origin; or it comes from the individual's wish to distinguish himself. Terms like *beaut* and *stunning* reveal the schoolboy's honourable discontent with battered and bleached phrasing and show his contempt for words worn threadbare. Much Australian slang has come from Cockney English and from American, the latter being now on the increase. *Bonzer* is giving way to *swell.* , Intelligent philological guesswork can usually trace the origin of slang terms, *e.g.*, *plonk* is probably First-World-War *(vin) blanc.* In establishing an etymology, the evolution of both sound and meaning must be rationalised in conjunction, *e.g.*, *un youm*; jackass; crayfish (Fr. *écrivisse*); scallop; and 'a second Royais' (<*aller à Rueil*) can thus be 'based'.

Any given trade or occupation has its technical jargon, not to be confused with slang; but the term 'jargon' is now also applied to verbal obscurities. Such jargon may reach the horror stage in English of the type, the 'receipt of your esteemed favour of the 10th inst.'—a jungle of *clichés* in which basic meaning is concealed by a high-sounding layer. Linguistic change of this kind shows the possible debasing, through the tyranny of words, of man's high faculty of true communication. In the end, a nation's or an individual's thoughts cannot be more accurate than the language in which they are spoken.

Dante said, 'Since man is a most unstable and changeable animal, no human speech can be permanent and continuous.'—But the miracle of language is enhanced by instantaneous speech-radiation, a social force from which unity may yet evolve from diversity. Linguistic science finds its joy in striving to discover how contacts may be made among men and why they succeed in a particular way. Thus linguistics may help in removing misunderstanding among the peoples of the earth.

Tasmanian littoral Spiders with Notes on their Respiratory Systems, Habits and Taxonomy

By

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(Read 2nd November, 1948)

FIGS 1-15

In certain localities on the coast of Tasmania it is not uncommon to find spiders which have succeeded in adapting themselves to an aquatic or semi-aquatic mode of life. Two species are frequently met with, namely *Amaurobioides litoralis* sp. nov. and *Desis kenyonae* Pocock. The present paper gives an account of these two species, including a description of the hitherto unknown male of *Desis kenyonae.*

Family AMAUROBIOIDIDAE nov.

Cribellum and calamistrum wanting. Colulus present. Six spinnerets. Eight eyes in two rows. Chelicerae with condyle and scopula. Both margins toothed. Lip free. Maxillae parallel, with scopula well delimited. Legs with spines. Tarsi and metatarsi scopulated. Two tarsal claws pectinate in a single row. Claw-tufts present. Trichobothria in two rows on tarsi, a single row on metatarsi and two rows on tibiae. Thoracic groove longitudinal. Tracheal spiracle single and median, a short distance in front of colulus. Tracheal system extending into the cephalothorax. Heart with three pairs of ostia.

Genus **Amaurobioides** O. P. Cambridge

Only two species have been recorded as belonging to this genus, namely *Amaurobioides maritima* Cambridge and *Amaurobioides piscator* Hogg. Both species occur in New Zealand. *A. maritima* is found on rocks in the sea at Allday Bay, Otago, and *A. piscator* occurs on rocks between tide marks on Campbell Island. To these is now added a third species taken at Eaglehawk Neck, Tasmania. The name *Amaurobioides litoralis* is proposed for the species.

Amaurobioides litoralis sp. nov.

Male

	mm.
Total length (excluding chelicerae)	7·420
Length of carapace	3·480
Width of carapace	2·320
Length of abdomen	4·234
Width of abdomen	2·204

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	2·610	1·334	2·668	2·610	1·508	10·730
2	2·494	1·334	2·610	2·610	1·392	10·440
3	2·146	1·160	1·856	2·262	0·928	8·352
4	2·494	1·334	2·262	2·378	0·928	9·396
Palp	1·218	0·580	0·464		1·450	3·712

Colour. Carapace, legs and palpi brown. Front of head region and chelicerae very dark brown, nearly black. Maxillae, labium and sternum light brown. Coxae fawn. Dorsal surface of abdomen dark brown marked with a fawn pattern as shown in fig. 1. Sides dark brown, ventral surface fawn. Spinnerets fawn.

Carapace. Elongate, somewhat narrowed in head region, widest between the second coxae. Front margin recurved. Posterior margin rounded. Cervical and radial grooves faintly marked. Thoracic groove longitudinal; its front end being about 2/3 of the length of the carapace from the anterior margin. Surface densely clothed with short fine recumbent silky hairs which point forwards.

Eyes. Eight, arranged in two rows. Viewed from above the front row is distinctly recurved and shorter than the hinder row, which is but slightly recurved. The eye-group occupies about half the width of the head. The eye space is black and the AME are mounted on a small tubercle that projects forward over the clypeus. Ratio of eyes AME : ALE : PME : PLE = 6 : 9 : 8 : 9. The AME are separated from each other by half their diameter and from ALE by one-third of their diameter. BME are separated from each other by 9/8 of their diameter and from PLE by once their diameter. The median ocular quadrangle is wider behind than in front in ratio 25 : 14. Its posterior width is greater than its length in ratio 25 : 23. The height of the clypeus is slightly less than the diameter of AME.

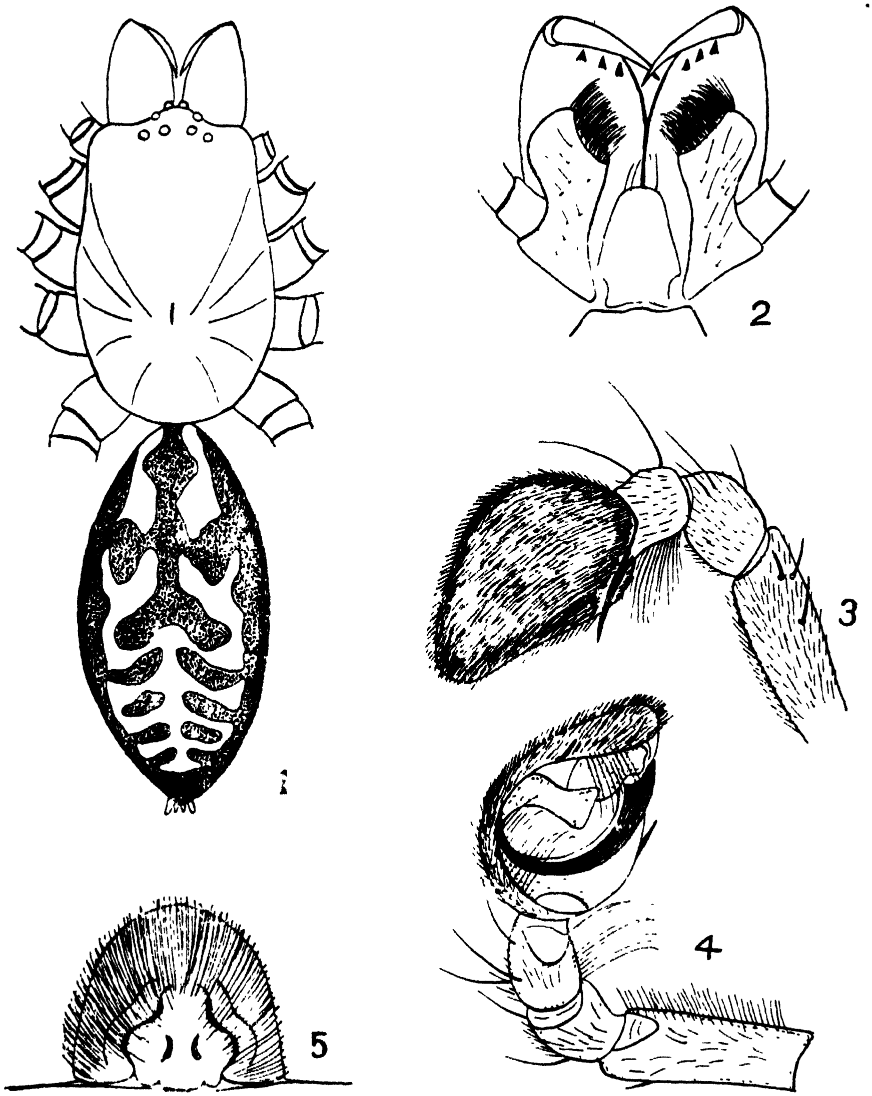
Chelicerae. Strong, geniculate, projecting forward and clothed with hairs in front. Furrow oblique; retromargin with three teeth of equal size; promargin with two large teeth and a small basal tooth.

Maxillae. Long, parallel, obliquely truncate on the inner side near the apex, rounded on the outer side and constricted near the middle. A dense scopula is present on the obliquely truncated part of the apex and a well-developed serrula on the rounded outer margin (fig. 2).

Labium. Longer than wide in ratio 14 : 9 and extending beyond the middle of the maxillae. Rounded at the apex and slightly emarginate on each side near the base (fig. 2).

Sternum. Long, ovoid and convex. Longer than wide in ratio 32 : 21. Widest between second coxae. Front margin slightly recurved. Lateral margins sinuous with slight projections opposite the coxae. Posteriorly the sternum ends in a point between the fourth coxae, which are separated by about half their diameter. Clothed with short fine hairs.

Legs. 1.2.4.3. A moderately dense scopula on the tarsi and metatarsi of the first and second pairs of legs. A thick clothing of ordinary hairs on the third and fourth pairs. Claw-tufts present on all legs. Two tarsal claws, each with a row of seven teeth. Trichobothria in two rows on tarsi, a single row on metatarsi and two rows on tibiae. Spines are present on all legs and are arranged as follows: *First leg*—Femur: dorsal 1-1-1, prolateral 0-0-1, retrolateral 0-1-0, ventral 0. Patella 0. Tibia: dorsal 0, prolateral 1-1-1-1, retrolateral 1-1-1-1-2, ventral 2-2-2-2-2-2. Metatarsus: dorsal 0-1-0, prolateral 1-1-1, retrolateral 1-1-1, ventral 0. Tarsus 0. *Second leg*—Femur: dorsal 1-1-1, prolateral 0-1-1, retrolateral 0-1-1, ventral 0. Patella 0. Tibia: dorsal 0, prolateral 1-1-1, retrolateral 1-1-1, ventral 2-2-2. Metatarsus: dorsal 0-1-0, prolateral 1-1-1, retrolateral 1-1-1, ventral 0. Tarsus 0. *Third leg*—Femur: dorsal 1-1-1, prolateral 0-1-1, retrolateral 0-1-1, ventral 0. Patella 0. Tibia: dorsal 0, prolateral 1-1-1, retrolateral 1-1-1, ventral 2-2-2. Metatarsus: dorsal 0-1-0, prolateral 1-1-1, retrolateral 1-1-1, ventral 2-2-2. Tarsus 0. *Fourth leg*—Femur: dorsal 1-1-1, prolateral 0-1-1, retrolateral 0-0-1, ventral 0. Patella 0. Tibia: dorsal 0, prolateral 1-1-1, retrolateral 1-1-1, ventral 2-2-2. Metatarsus: dorsal 0-1-0, prolateral 1-1-1, retrolateral 1-1-1, ventral 2-2-2. Tarsus 0.



Amaurobioides litoralis, sp. nov.

FIG. 1.—Dorsal view of male showing pattern on abdomen.
FIG. 2.—Chelicerae, maxillae and labium of male.
FIG. 3.—Retrolateral view of left palp of male.
FIG. 4.—Ventral view of left palp of male.
FIG. 5.—Epigynum.

Palpi. Tibial segment short and produced into a long sharp apophysis at the apex on the retrolateral side. Tarsus large and ovoid. Femur has 1-1-1 spines on dorsal side and 0-0-1 on both prolateral and retrolateral sides. Elsewhere spines are absent. The form of the palp and genital bulb is shown in figs 3 and 4.

Abdomen. Oblong, nearly twice as long as wide. Clothed with short fine hairs. Anterior spinnerets stout and conical with a very short apical segment. Middle and posterior spinnerets cylindrical and arranged in a transverse row above the anterior spinnerets. Apical segment of hind spinnerets minute. A short colulus is present. Pulmonary spiracles in the usual position. Tracheal spiracle single and median, situated about the length of the anterior spinnerets in front of the colulus.

Female

	mm.
Total length (excluding chelicerae)	12·00
Length of carapace	4·35
Width of carapace	3·31
Length of abdomen	7·83
Width of abdomen	4·06

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	3·48	1·80	2·78	2·55	1·62	12·23
2	3·36	1·74	2·78	2·49	1·51	11·88
3	2·90	1·51	2·09	2·32	1·16	9·98
4	3·19	1·80	2·73	2·61	1·16	11·49
Palp	1·74	0·70	0·81		1·45	4·70

Colour. Carapace and chelicerae very dark brown, almost black. Legs reddish brown above merging into yellow on the sides and ventral surface of the femora and on the apex of each patella. Maxillae and labium dark reddish brown, the apex of the labium and the inner side of the apex of each maxilla being yellow. Coxae yellowish. Sternum yellowish in the middle, brown round the margin. Abdomen dark brown above ornamented with paired yellowish areas and chevrons as in the male. Sides of abdomen dark brown merging into yellow on the ventral surface. Epigynum yellowish brown.

Carapace. Oblong, its width in front being only slightly less than its greatest width. Cervical and radial grooves not distinct. Thoracic groove longitudinal and situated about 2/3 of the length of the carapace from the front. Surface clothed with short fine recumbent hairs which point forwards.

Eyes. Eight, arranged in two rows. Front row shorter than posterior row in ratio 13 : 22. Viewed from above the front row is slightly recurved and the posterior row is straight. Ratio of eyes AME : ALE : PME : PLE = 6 : 12 : 11 : 14. The AME are separated from each other by 7/6 of their diameter and from ALE by half their diameter. The PME are separated from each other by 13/11 of their diameter and from PLE by 9/11 of their diameter. The lateral eyes are separated by a distance equal to the diameter of AME. The median ocular quadrangle is wider behind than in front in ratio 35 : 19 and its length is shorter than its posterior width in ratio 26 : 35. The front row of eyes is very close to the margin of the clypeus, the height of the clypeus below AME being equal to the diameter of AME.

Chelicerae. Stout, conical and geniculate. Provided with large yellowish lateral condyles. In front the surface is rough and furnished with coarse black

hairs. Margins of furrow oblique. Promargin with three teeth, the basal tooth being smaller than the others. Retromargin with three teeth of equal size. Fang strong and moderately curved.

Maxillae. Parallel. Rounded in front with an oblique truncation and dense scopula on the inner side near apex. Constricted in middle as in the male.

Labium. Longer than wide in ratio 7 : 5. Exceeding half the length of the maxillae. Excavated on each side at the base. Apex rounded and fringed with long black hairs.

Sternum. Long shield-shaped, its length being greater than its width in ratio 50 : 28. Pointed posteriorly between the fourth coxae, which are separated by about half their diameter. The surface is slightly convex and shows indistinct elevations opposite the bases of the coxae. The margin is produced into a point opposite each coxa.

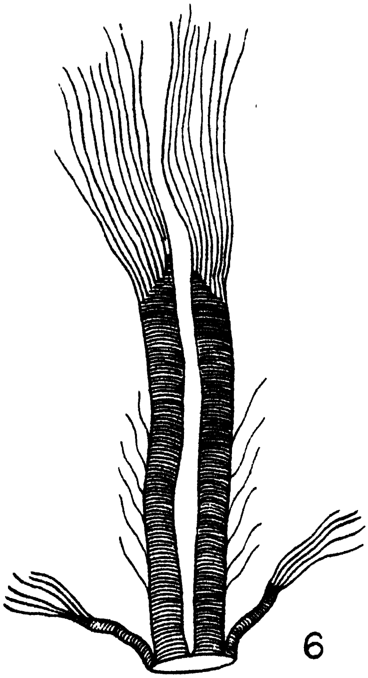
Legs. 1.2.4.3. Clothed with hairs and long bristles. The tarsi and metatarsi of the two front pairs of legs are scopulate to base, those of the two hind pairs of legs have a thick clothing of ordinary hairs on the ventral side. Trichobothria in two rows on tibiae, a single row on the metatarsi and a double row on the tarsi. Two tarsal claws are present and furnished with about seven long teeth. Claw-tufts of spatulate hairs are present on all the legs. Spines are arranged as follows: *First leg*—Femur: dorsal 1-1-1, prolateral 1 at apex, elsewhere 0. Patella 0. Tibia: ventral 2-2-2, elsewhere 0. Metatarsus: ventral 2 near base, elsewhere 0. *Second leg*—Femur: dorsal 1-1-1, prolateral 1 at apex, elsewhere 0. Patella 0. Tibia: dorsal 0, prolateral 1, retrolateral 0, ventral 1-1-2. Metatarsus: dorsal 0, prolateral 1 near middle, retrolateral 0, ventral 2 near base. *Third leg*—Femur: dorsal 1-1-1, prolateral 1 at apex, elsewhere 0. Patella 0. Tibia: dorsal 0, prolateral 1-1-1, retrolateral 1-0-1, ventral 2 at apex. Metatarsus: dorsal 2 near apex, prolateral 1 at apex, retrolateral 1 at apex, ventral 2-0-2. *Fourth leg*—Femur: dorsal 1-1-1, prolateral 0, retrolateral 1 at apex, ventral 0. Patella 0. Tibia: dorsal 0, prolateral 0, retrolateral 1 near apex, ventral 1-1-2. Metatarsus: dorsal 2 near apex, prolateral 1 near apex, retrolateral 1 near apex, ventral 1-0-2. No spines are present on any of the tarsi.

Palpi. Clothed with long hairs and slender bristles. Spines are present on the dorsal side of the femur and on the prolateral side of the tibia and tarsus. The tarsal claw is slightly curved and provided with three very small teeth in the basal half.

Abdomen. Long ovoid. Clothed with fine short recumbent hairs intermingled with longer erect hairs. The pulmonary spiracles are in the normal position. The tracheal spiracle is single and median. It is situated in front of the spinnerets and at a distance from them equal to the length of the anterior pair. The spinnerets form a compact group. The front pair are stout and conical. The posterior pair are about equal in length to the front pair but much more slender. The middle pair are small and partly concealed by the others. A small colulus is present. The epigynum has the form shown in the fig. 5.

Locality. The male and female type specimens, together with a number of others of the same species, were collected at Eaglehawk Neck, Tasmania, during February, 1948.

Amaurobioides litoralis closely resembles *A. maritima* Cambridge. However, according to Cambridge (1883, p. 356) the cephalothorax of *A. maritima* is twice as long as it is broad. Moreover the figure (Cambridge, 1883, Plate XXXVI, fig. 3*e*) depicting the maxillae and labium of *A. maritima* shows the maxillae curved on



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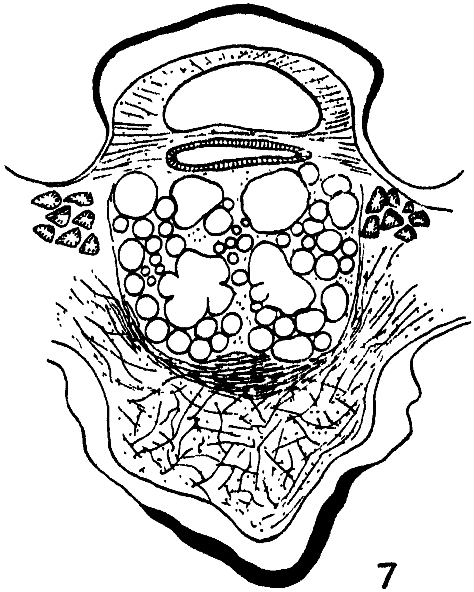

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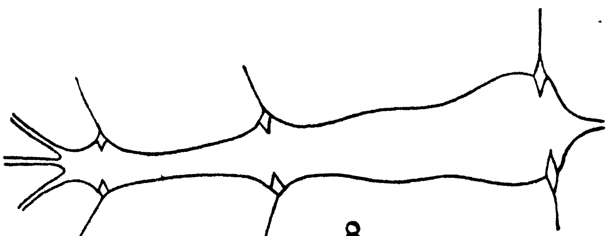

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Amaurobioides litoralis, sp. nov.

FIG. 6.—Tracheal tubes.

FIG. 7.—Transverse section through petiolus showing main tracheal trunks dividing into tubules which lie below the gut.

FIG. 8.—Dorsal view of heart showing position of the ostia.

the inner side and the labium without lateral excavations at the base. If the figures are correct the structures differ from those of *A. litoralis*.

The species *A. piscator* Hogg (1909, p. 164) described from the Campbell Islands differs from *A. litoralis* in the leg formula, in having spines on the under side of the femora and in the form of the epigynum.

Respiratory System and Heart. The respiratory system consists of a pair of book-lungs in the usual position and tracheal tubes which supply both cephalothorax and abdomen. As mentioned previously the tracheal spiracle is single and median and is situated a short distance in front of the spinnerets. It leads into two stout median trunks and two much smaller lateral trunks (fig. 6). The two large median trunks pass straight forward and enter the petiolus. Here they divide into a number of smaller tubules (fig. 7), which enter the cephalothorox and extend into the appendages. The abdomen is supplied mainly by the two small lateral trunks. These also divide to form a number of fine tubules. In addition to these the abdomen also receives a few small tubes from the sides of the large median trunks as they pass towards the petiolus.

The heart is in the usual position close beneath the dorsal surface of the abdomen. It has three pairs of ostia arranged as shown in fig. 8.

Habits. *A. litoralis* makes a small nest of tough white silk in crevices and holes in rocks near high-tide mark. The nest is about 3 or 4 cms. long and more or less oval in shape. It has a small tubular exit on one side. In some cases the nests are made among shell-grit that has accumulated between rocks just below the high-tide mark. In most cases, however, the nests are situated above high-tide level, although the rocks on which they occur may be surrounded by water and splashed by the waves. The crevices in which the nests are made are often frequented by Isopods of the genus *Ligia* and remnants of these crustacea sometimes occur in the nests of the spider.

The egg-sac of *A. litoralis* is lenticular, about 8 mm. in diameter and made of white silk. It is attached to the inner surface of the wall of the nest. One egg-sac in which the eggs were counted contained 60 eggs. These are yellow in colour and measure 1·05 mm. in diameter. Not more than one egg-sac is found in the nest. During the first fortnight in February when the specimens were collected some nests contained eggs in process of development and others young spiders newly emerged from the egg-sac.

Most of the males apparently reach maturity later in the year, probably in the autumn, since the 75 specimens collected included only one mature male. The remaining 74 specimens were composed of 33 mature females, 24 immature females and 17 immature males. Two of the immature males were kept in vivaria in the laboratory until they reached maturity.

Taxonomy. The genus *Amaurobioides* Cambridge is considered by Simon (1903, p. 1034) as synonymous with *Uliodon* L. Koch. Hogg (1909, p. 162), however, states that *Amaurobioides piscator* differs materially from *Uliodon* and places it in the Clubionidae. Dalmas (1917, p. 394) follows the classification proposed by Hogg. Petrunkevitch (1908, p. 210) agrees with Simon in regarding the genus *Amaurobioides* as a synonym of *Uliodon*, and places the genus *Uliodon* in the family Ctenidae. Bristowe (1930, p. 344) agrees with Petrunkevitch.

These different views are largely due to the fact that the descriptions of *A. maritima* Cambridge and *A. piscator* Hogg omit to mention such important characters as the colulus, the position of the tracheal spiracle, the distribution of the tracheal tubes, etc. In the Tasmanian species *A. litoralis* a colulus is present, the tracheal spiracle is a short distance in front of the spinnerets and the

tracheal system enters the cephalothorax and its appendages. In all these features *A. litoralis* differs from members of the Clubionidae and Ctenidae. Moreover, members of the Ctenidae are usually wandering spiders, which do not make a permanent silken nest, whereas *A. litoralis* makes a tubular retreat in which it lives. For these reasons it seems necessary to establish a new family, Amaurobioididae, for the three species of *Amaurobioides*. The family is most closely related to the Clubionidae.

Whether the genus *Uliodon* should be included in the family cannot be determined until more detailed descriptions of the species are available.

Family AGELENIDAE

Genus **Desis** Walckenaer, 1837

Desis kenyonae Pocock

Male

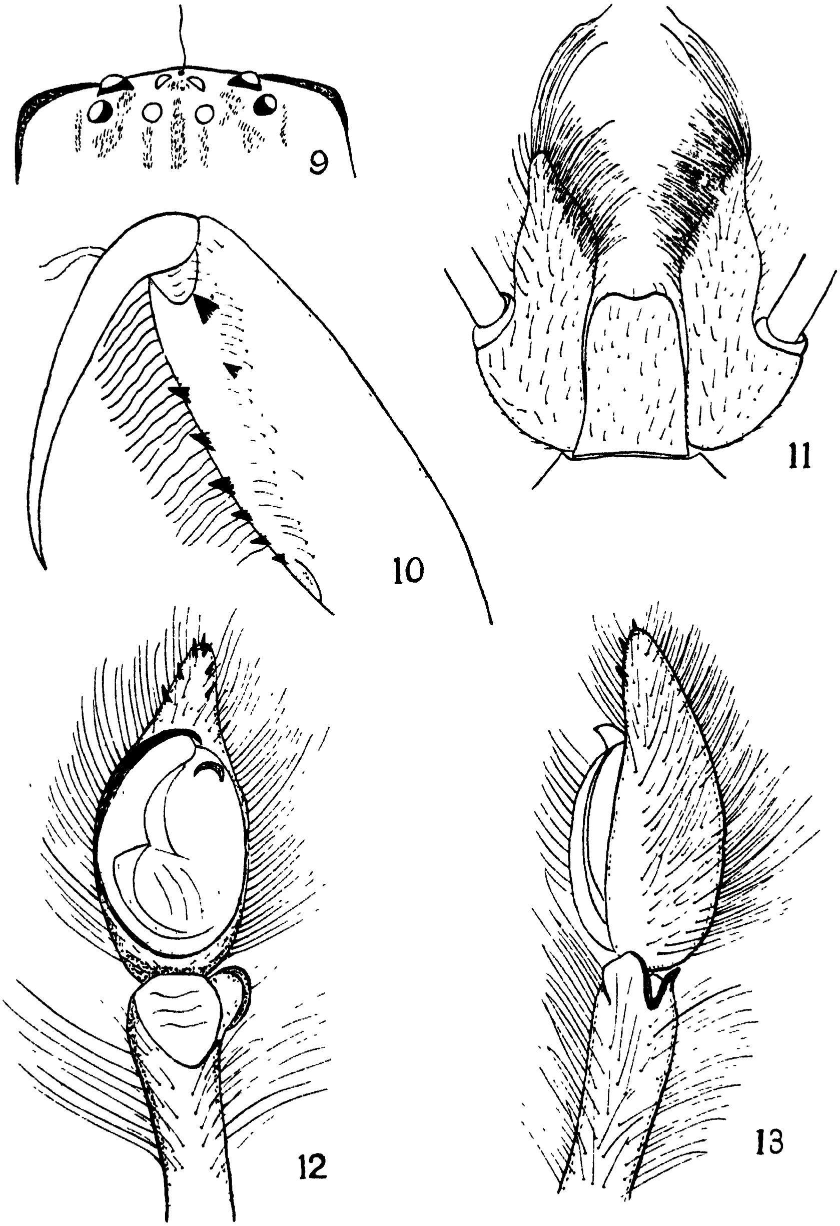
	mm.
Total length (excluding chelicerae)	9·280
Length of carapace	4·350
Width of carapace	2·900
Length of abdomen	4·930
Width of abdomen	2·668

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	3·770	1·914	4·234	4·524	2·494	16·936
2	2·900	1·624	2·668	2·900	1·624	11·716
3	2·436	1·218	1·914	2·436	1·160	9·164
4	2·900	1·508	2·726	2·900	1·508	11·542
Palp	1·972	0·812	1·450		1·392	5·626

Colour. Carapace, legs, palpi, maxillae, labium and sternum yellowish brown. Basal segment of chelicerae golden brown, fang dark reddish brown. Upper surface and sides of abdomen greyish brown, ventral surface and spinnerets somewhat lighter in colour.

Carapace. Oblong, truncate in front. Head region almost as wide as thoracic region. Sides gently rounded. Posterior end slightly emarginate. Thoracic groove longitudinal, situated about 2/3 of the length of the carapace from the front. Radial striations distinct but not deep. The head region is clothed with short recumbent hairs which point forward. Thoracic region has few hairs.

Eyes. The eight eyes are arranged in two rows (fig. 9). Viewed from above both rows appear almost straight. Viewed from in front the anterior row is slightly procurved, the lateral eyes being nearer the edge of the clypeus than are the median eyes. The width of the eye-group is slightly more than half the anterior width of the carapace. The front row of eyes is shorter than the posterior row in ratio 68 : 78. Ratio of eyes AME : ALE : PME : PLE = 7 : 10 : 8 : 8. The AME are separated from each other by 5/7 of their diameter and from ALE by 10/7 of their diameter. The PME are separated from each other by 15/8 of their diameter and from PLE by 18/8 of their diameter. The lateral eyes are separated by 5/7 of the diameter of AME. The median ocular quadrangle is wider behind than in front in ratio 30 : 19. Its length is slightly greater than its anterior width. The AME are dark coloured; all the other eyes have a white pearly appearance. The lateral eyes of each side and the AME are mounted on slight elevations. A long slender hair projects in front of AME. On each side above the condyle of the chelicera the margin of the clypeus is dark reddish brown. The distance from the AME to the front margin is equal to 6/7 of the diameter of AME.



Desis kenyonae Pocock

FIG. 9.—Eyes of male.
FIG. 10.—Ventral view of left chelicera of male.
FIG. 11.—Maxillae and labium of male.
FIG. 12.—Ventral view of left palp of male.
FIG. 13.—Retrolateral view of left palp of male.

Chelicerae. Very large, powerful and projecting forwards. The length of the basal segment is equal to 4/5 of the length of the carapace. Promargin provided with a row of six teeth, which are evenly spaced and decrease slightly in size towards the base. Retromargin is furnished with two teeth, one of which is large and situated near to the base of the fang, while the other is much smaller and almost opposite the apical tooth of the promargin (fig. 10). The fang is dark reddish brown, very long and slightly curved. When closed its tip rests in a small depression on the basal segment. There is a thick scopula of long hairs on the promargin and a somewhat lighter scopula on the retromargin. The dorsal surface is provided with a few very small scattered hairs.

Maxillae. Parallel, sharply pointed in front, with curved outer margin and oblique inner margin (fig. 11). A serrula is absent. A scopula of long hairs is situated at the apex and on the inner margin. Surface is lightly clothed with long hairs.

Labium. Longer than wide in ratio 4 : 3. The length is equal to about 4/7 that of the maxillae. The apex is truncate and slightly emarginate (fig. 11).

Sternum. Long shield-shape, ending in a point between the fourth coxae. Front margin with a projection on each side. Lateral margins with small projections opposite the coxae and also opposite the spaces between the coxae. Surface clothed with long hairs.

Legs. 1.2.4.3. The front pair much longer than the others. All the legs are clothed with long outstanding hairs. The last three pairs of legs, but not the first pair, have a much thicker clothing of hairs at the apex of the metatarsus than elsewhere. Trichobothria in two rows on the tarsi, a single row on the metatarsi and two rows on the tibiae. Scopulae and claw-tufts absent. Three tarsal claws are present. Upper claws similar with about 11 teeth on those of the front legs and 8 on those of the hind legs. Lower claw is strongly curved and without teeth. Spines are arranged as follows: *First leg* has no spines. *Second leg*—Femur 0. Patella 0. Tibia: ventral 1 at apex on prolateral side, elsewhere 0. Metatarsus: ventral 1 near middle and 3 at apex, elsewhere 0. *Third leg*—Femur 0, Patella 0. Tibia: ventral 1 at apex on retrolateral side, elsewhere 0. Metatarsus: ventral 2 near middle and 3 at apex, elsewhere 0. Tarsus: ventral 4 small spines close together in apical quarter. *Fourth leg*—Femur 0. Patella 0. Tibia: ventral 1 at apex on retrolateral side, elsewhere 0. Metatarsus: ventral 1 near middle on retrolateral side, 3 at apex, elsewhere 0. Tarsus: ventral 5 small spines in the apical quarter. All the spines are small and easily overlooked owing to the dense clothing of long hairs. The number of spines varies slightly in different specimens and sometimes on the corresponding left and right legs of the one specimen.

Palpi. Long and slender. Femur slightly curved. The length of the trochanter is almost 2/3 that of the femur. The tibia has a short cleft apophysis on the retrolateral side at the apex (fig. 13). The tarsus is spoon-shaped and produced into a somewhat pointed apex. All segments are clothed with long hairs and the tarsus is provided with a few small spines at the apex. The genital bulb forms a rather flat oval disc. The embolus curves round the prolateral margin of the disc (fig. 12). Trichobothria are arranged in a row on each side of the tibia

Abdomen. Ovoid. The dorsal surface and sides clothed with long erect hairs, which are curved forwards. The anterior pair of spinnerets are short, stout and conical. The posterior pair cylindrical and slightly longer than the front pair. The middle spinnerets are short and somewhat triangular in section. A colulus is absent. The tracheal spiracle is single and median. It opens close in front of the spinnerets.

Female

	mm.
Total length (excluding chelicerae)	10·730
Length of carapace	4·756
Width of carapace	3·364
Length of abdomen	5·800
Width of abdomen	3·826

Leg	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
1	3·774	2·030	4·118	4·234	2·320	16·476
2	2·958	1·682	2·668	2·900	1·566	11·774
3	2·726	1·392	2·030	2·552	1·160	9·860
4	3·248	1·682	2·900	3·074	1·334	12·238
Palp	2·204	0·870	1·624		1·740	6·438

The female resembles the male in colouration and general appearance. The description given by Pocock (1902, p. 102) is correct as far as it goes. However, he does not describe the following features:

Labium. Somewhat rectangular, slightly emarginate at the apex. Longer than wide in ratio 23 : 14, and more than half the length of the maxillae.

Maxillae. Parallel, broad at the base, pointed at the apex, rounded on the outer margin and obliquely truncate on the inner margin. Scopula as in the male. Serrula absent.

Sternum. Long shield-shape. Longer than wide in ratio 45 : 31. Widest between the second coxae. Surface slightly convex, almost flat, clothed with long hairs. Margin slightly rebordered and furnished with projections as in the male.

Legs. 1.4.2.3. Clothed with long hairs. Trichobothria arranged as in male. Upper tarsal claws similar with about 12 teeth in those of the front legs and 10 in those of the hind legs. Lower claw without teeth. The spines on the legs are arranged as follows: *First leg* has no spines. *Second leg*—Tibia: ventral 1 in the middle, 3 at apex. *Third leg*—Tibia: ventral 2 at apex. Metatarsus: dorsal 2 at apex, prolateral 1 near middle, ventral 1 near middle, 3 at apex. Tarsus: ventral several small spines near apex. *Fourth leg*—Tibia: ventral 2 at apex. Metatarsus: ventral 1 near middle, 3 at apex. Tarsus: ventral several small spines near apex. Elsewhere on the legs spines are absent.

Palpi. Clothed with long hairs. A few small spines are present on the ventral side of the tarsus near the apex. Claw slightly curved and furnished with five small teeth. Two rows of trichobothria on dorsal surface of tibia and tarsus. Trochanter very long, slightly more than half the length of the femur.

Abdomen. Ovoid. Densely clothed with long erect curved hairs interspersed with somewhat shorter recumbent hairs. In surface view the epigynum has the form described and figured by Pocock (1902, p. 102). In transparent preparations it has the form shown in fig. 14. Spinnerets as in the male. Tracheal spiracle single and median, situated in front of the spinnerets at a distance about equal to the length of the anterior pair.

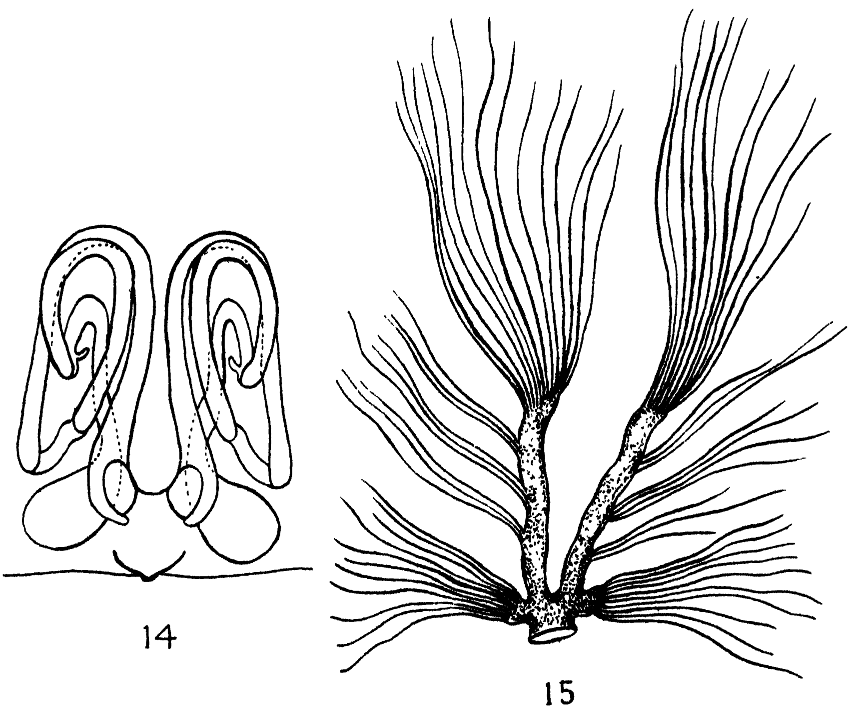
Locality. The allotype male together with a number of other males and females was collected at Eaglehawk Neck, February, 1948. The spider has also been found at Adventure Bay on Bruni Island, at the Gardens on the East Coast of Tasmania and at Gravelly Beach on the River Tamar. The holotype female, on which Pocock based his description of the species, was found at San Remo, Westernport Bay, Victoria.

Respiratory System and Heart. The respiratory system consists of a pair of book-lungs in the normal position and tracheal tubes confined to the abdomen. The book-lunk of a male specimen was examined in serial sections and found to have about 50 leaves.

The tracheal spiracle, which opens a short distance in front of the spinnerets, leads into two stout median trunks, which extend forward for about one-quarter the length of the abdomen. Lateral trunks, which are present in many spiders, are reduced to a pair of short stump-like branches, one on each side near the base of the median trunks. Both the median trunks and the short lateral branches divide and give rise to numerous fine tubules, all of which supply the abdomen. No tubules pass into the cephalothorax (fig. 15).

The heart of *Desis kenyonae* has three pairs of ostia and resembles that of *Desis formidabilis* Cambridge, which has been described by Petrunkevitch (1933, p. 371).

Habits. With the exception of those collected at Gravelly Beach, which is about 20 miles up the Tamar estuary from the mouth, all the specimens of *Desis kenyonae* were found on the sea coast. The spider lives between high-tide and low-tide levels, where it may be found occupying empty mollusc shells, cavities on the under side of rocks or crevices among *Galeolaria* tubes. The spider lines the cavity with a layer of silk and closes the opening with a sheet of web.



Desis kenyonae Pocock

FIG. 14.—Epigynum as seen in a transparent preparation.
FIG. 15.—Tracheal tubes.

At other times a cocoon-like nest is made in the narrow space between two rocks. Unlike *Amaurobioides litoralis*, *Desis kenyonae* never makes its nest above high-tide level.

During December, 1947, and February, 1948, 9 mature males, 5 mature females and a number of immature forms were collected at Eaglehawk Neck. Two egg-sacs were found on 4th December. One sac contained 30 eggs, the other 30 spiderlings almost ready to emerge. The egg-sac is lenticular in shape and measures about 17 mm. in diameter. It is made of white silk. The outermost layer is tough and parchment-like and has a shiny lustre. The egg-sac is placed on the side of the cavity occupied by the spider, and the mouth of the cavity is closed over by a sheet of silk. Such sealed up nests containing the egg-sac and the female spider are sometimes placed in cavities on the under side of rocks almost at the low-tide level, so that for the greater part of the day the nest is completely submerged. However, the cavity which is used for the nest is generally in such a position, that when the tide comes in the air contained in the cavity is not displaced. Moreover, the strong sheet of web, which covers the opening, helps to retain the air and exclude the water.

Desis kenyonae will live for several weeks in specimen tubes, if filter paper or cotton wool soaked in sea-water is placed in the tube with the spider. Specimens kept in this manner in the laboratory fed eagerly on ordinary house-flies. A female made an egg-sac in one of the tubes. It was firmly fixed in the angle between the bottom of the tube and the side. By placing a strong light behind the egg-sac the eggs could be observed. They hatched in 47 days from the time the egg-sac was made. The newly hatched spiderlings remained in the sac and after 14 days from the time of hatching they underwent their first post-embryonic ecdysis. The egg-sac was then opened in order to examine the young spiders more closely. Hence the normal mode of escape from the sac could not be observed.

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PAP. & PROC. ROY. SOC. TASMANIA, 1948 (15TH SEPTEMBER, 1949)

New Species of Astacilla from Tasmanian Waters

By

ERIC R. GUILER

(Read 2nd November, 1948)

FIGS 1-8

The only reference to any members of this family Arcturidae being encountered in Tasmanian waters is contained in Haswell's work on the Australian Crustacea (Haswell, 1882, p. 303). This reference is of a doubtful nature, the specimen being found in the Australian Museum collection pinned on a sheet of cork with several specimens from Tasmania, and was deduced to have come from Tasmania.

This specimen was described as *Arcturus longicornis* (Haswell cit.). More recently Hale describes it as being a synonym of *Arcturus baffini*, Sabine, found in the Davis Straits (Hale, 1946, p. 171).

The specimens which I describe below were all taken in a very restricted area, the northern end of the D'Entrecasteaux Channel.

The genus Astacilla was established by Cordiner (1795). Tattersall raised the genus Neastacilla (Tattersall, 1921, p. 243), defining the genus as '. . . agreeing with *Astacilla* Cordiner, except that (1) the 2nd thoracic segment is fused to the head and the lateral parts are not expanded downwards and forwards to partially cover the mouth organs; (2) the abdomen is unsegmented, all being fused into one piece'. As a type he designated *Neastacilla* (Astacilla) *falclandica*, Ohlin.

Nordenstam modified the genus Neastacilla, his diagnosis reading 'The first pereion segment coalesced with the head, but separated from the head by a groove which is absent dorsally. The lateral parts of the first pereion segment are not expanded downwards and forwards. Abdomen with three segments indicated by shallow grooves anterior from the pleotelson. Dactylus of first pereiopod not expanded, tapering towards the end and claw missing. "Secondary" ramus of uropod furnished with a long apical seta.' (Nordenstam, 1933, p. 118).

Nordenstam points out doubts as to the validity of the genus Neastacilla. In particular, doubts are expressed as to whether the grooves separating the head from the first pereion segment and the abdominal grooves are sufficiently characteristic to be called generic characters.

Hale places in Astacilla two species previously described as Neastacilla (Hale, 1924, p. 209, and Hale, 1946, p. 171), the evidence for this being the presence of two setae on the secondary ramus of the uropod and the doubtful nature of the characters expressed by Nordenstam.

Stebbing noted that the secondary ramus of the uropod bears an additional minute seta on its upper margin (Stebbing, 1905), in the species *Astacilla amblyura*.

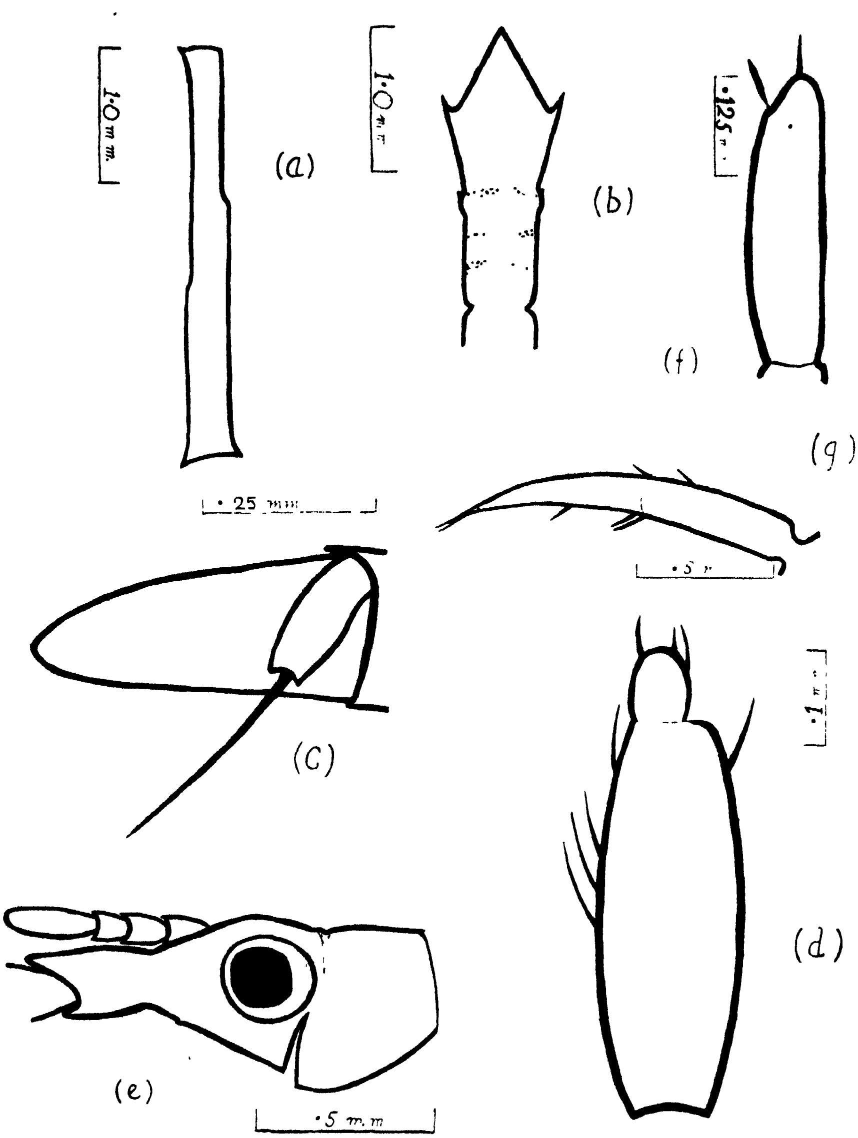

FIG. 1.—*Astacilla monoseta*, male. *(a)* Lateral view of IVth pereion segment. *(b)* Dorsal view of pleon. *(c)* Inner surface of right uropod. *(d)* Inner surface of dactylus of first pereiopod. *(e)* Lateral view of cephalon and first pereion segment. *(f)* Lateral view of flagellum of first antenna. *(g)* 'Claw' of second antenna.

From the evidence of the above authorities and from the evidence of the condition to be seen in my own specimens described below, especially in *Astacilla monoseta*, I consider the genus Neastacilla to be superfluous.

Astacilla monoseta, sp. nov.

(Figs 1 and 2)

Male

Body smooth. Two pairs of lateral spines on the pleon. From above the anterior pair of these spines appear as round tubercles. The whole animal is covered with brown pigment. The body is slender and of total length, including second antennae, of 14·5 mms.

Cephalon fig. 1 (*e*) has a slight median dorsal process projecting between the basal segments of the first antennae. The cephalon is separated from the first pereion segment by a faint dorsal groove. The first pereion segment is produced downwards to cover the mouth parts. The second and third pereion segments are short, the sum of their lengths being less than that of the cephalon and the first pereion segment.

The fourth pereion segment is nearly three times as long as the cephalon and the first to third pereion segments combined. It is nearly one third of the total length of the animal. The segment is slightly broader posteriorly than anteriorly, fig. 1 (*a*).

The fifth pereion segment is longer than either the sixth or seventh.

In all of the pereion segments the coxal plates are not visible from above.

The pleon, fig. 1 (*b*), is slightly longer than pereion segments five to seven and terminates in a median apex. There are two pairs of lateral spines. Three faint dorsal grooves indicate the abdominal segments.

The first antenna is short. The peduncle of the first antenna not reaching beyond the middle of the first peduncular joint of the second antenna. The flagellum of the first antenna does not extend beyond one-quarter of the length of the second peduncular joint of the second antenna. The flagellum, fig. 1 (*f*), bears one terminal and one sub-terminal sensory appendage.

The second antenna is long and almost one-third of the total length of the animal. Reading inwards from and including the 'claw' the ratios of the principal segments are 1 : 4 : 4 : 2. The 'claw' of the second antenna is of three segments and bears two terminal sensory setae. There are two dorsal and three ventral spines also on the claw, fig. 1 (*g*).

The dactylus of the first periopod has few setae, fig. 1 (*d*). None of these setae are sufficiently enlarged to form a claw. The remaining limbs of the first four pereion segments are typical of those of the group as a whole, varying only in minor detail.

The limbs of the fifth to seventh pereion segments are clawed.

The secondary ramus of the uropod is approximately a quarter of the length of the other ramus and bears a long, slender spine which is over twice as long as the ramus, fig. 1 (*c*).

The specimen was dredged in ten fathoms in the northern end of D'Entrecasteaux Channel and was found among red algae, January 1948.

Female

Very different in outward appearance from the male. Body smooth with lateral ridges running down each side of the fourth pereion segment. The whole animal is covered with pigment, especially the lateral surfaces of the pleon. Two pairs of lateral spines are on the pleon. Pleon is sharply pointed posteriorly. The body is stout and of a total length of 31·75 mms.

The cephalon differs from the male in that the eye is sub-triangular, whereas in the male it is sub-circular. The lateral downgrowth of the first pereion segment is of different form than in the male, fig. 2 (*a*). The groove separating the cephalon and the first pereion segment is much better developed than in the male. The second and third pereion segments are short, the sum of their lengths being less than that of the cephalon and first pereion segment combined. Round the anterior and posterior edges of each perion segment are a series of tubercles. These tubercles are arranged in a single row in each instance. There are tubercles scattered irregularly over the cephalon and also an anterior and a posterior row of them. The tubercles are very small and are difficult to see in the male, but quite prominent in the female.

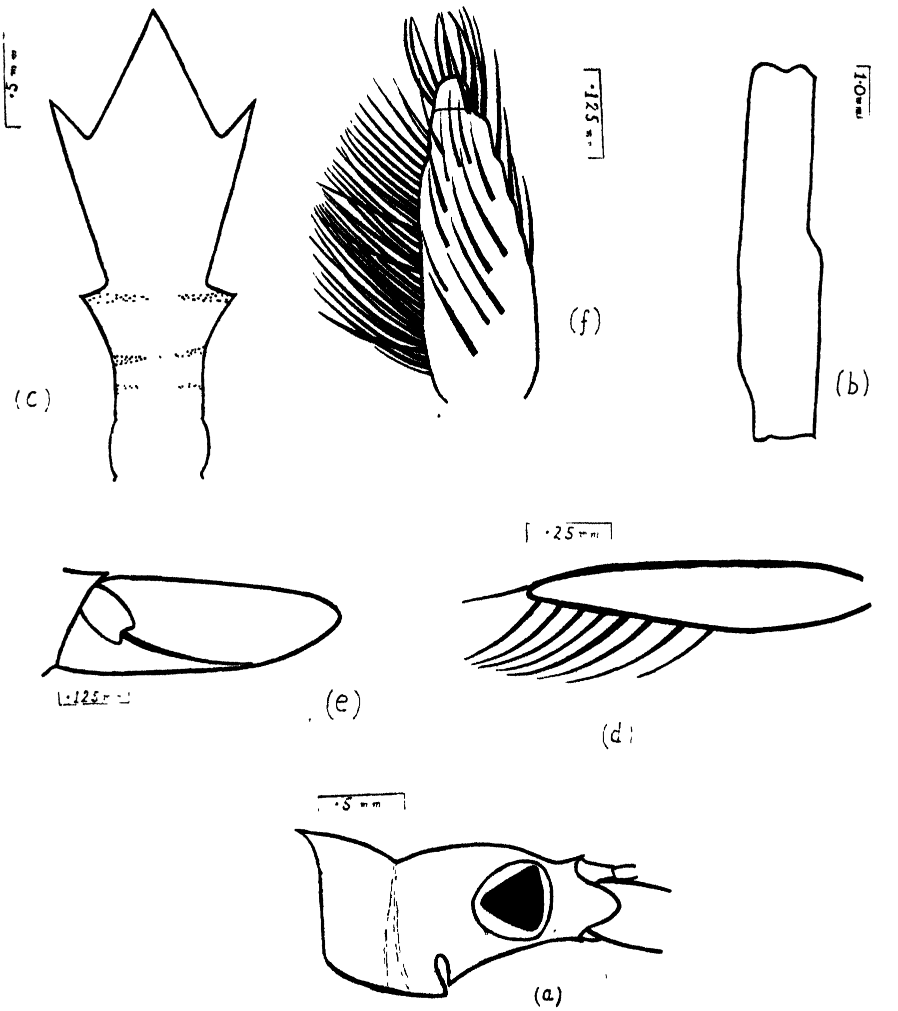

FIG. 2.—*Astacilla monoseta*, female. *(a)* Lateral view of cephalon and first pereion segment. *(b)* Lateral view of IVth pereion segment. *(c)* Pleon, dorsal view. *(d)* First antenna, lateral view. *(e)* Inner surface of the left uropod. *(f)* Dactylus of first pereiopod.

The fourth pereion segment is over twice the length of the cephalon and pereion segments one to three inclusive. It is only one-quarter of the total length of the animal. It is much broader than in the male. It is broader posteriorly than anteriorly.

The fifth pereion segment bears on its dorsal surface a small sharp median spine. In the male this spine is represented by a small tubercle.

The abdominal segments are indicated by grooves on the dorsal surface of the pleon. The anterior pair of lateral spines does not appear rounded from above. The pleon is more sharply pointed than in the male. It is greater in length than pereion segments five to seven.

The relationship between the segments of the first antenna and those of the second antenna are the same in the female as in the male. The flagellum of the first antenna in the female bears one terminal and eight ventral and sub-terminal sensory appendages.

The ratios of the lengths of the segments of the second antenna are the same as in the male.

The dactylus of the first pereiopod bears seven setae which are distributed evenly over the surface of the limb, fig. 2 *(f)*. The propodite bears a great many setae on the exterior surface, while the lateral surface bears many strong, spine-like setae. The inner surface of the propodite only has six setae. None of the setae of the dactylus could be called a 'claw'.

The limbs of pereion segments two, three and four are all similar to those of the male. The fifth, sixth and seventh pereion segments are clawed.

The 'secondary' ramus of the uropod bears a single spine, fig. 2 (*e*). The form of the secondary ramus is different from that of the same structure in the male.

Dredged in ten fathoms in D'Entrecasteaux Channel, January, 1948. Among red algae.

This species possesses both Astacillid characters and also several characters of the genus Neastacilla. Comparing the features of the specimen with the diagnosis of the genus Neastacilli as modified by Nordenstam (1933), we find that the lateral part of the first thoracic segment is expanded down and forwards and that the groove separating the cephalon from the first pereion segment is not missing dorsally. These are not Neastacillid features as defined but are Astacillid. The dactylus of the first pereiopod is not expanded and there is no claw is a Neastacillid feature, as is the single apical seta on the 'secondary' ramus of the uropod. The abdomen having three shallow grooves is a Neastacillid feature.

Astacilla inaequispinosa, sp. nov.

(Figs 3 and 4)

Male

Body smooth, stout. Total length 14·25 mms. One very large median conical projection on the cephalon between the eyes.

The cephalon is shorter than in any other species encountered, being only one-twelfth of the total length. The eye is sub-oval. The large projection on the dorsal cephalic surface between the eyes is slightly convex anteriorly and straight posteriorly. It is simple at the apex, not faintly bifid as in *Astacilla sheardi*, Hale. The only indication of the fusion of the cephalon and the first pereion segment is a slight dorsal depression visible in lateral view, fig. 3 (*i*). There is no anterior and downward projection of the first pereion segment. The second and third pereion segments are of moderate length, being about three-quarters of the length

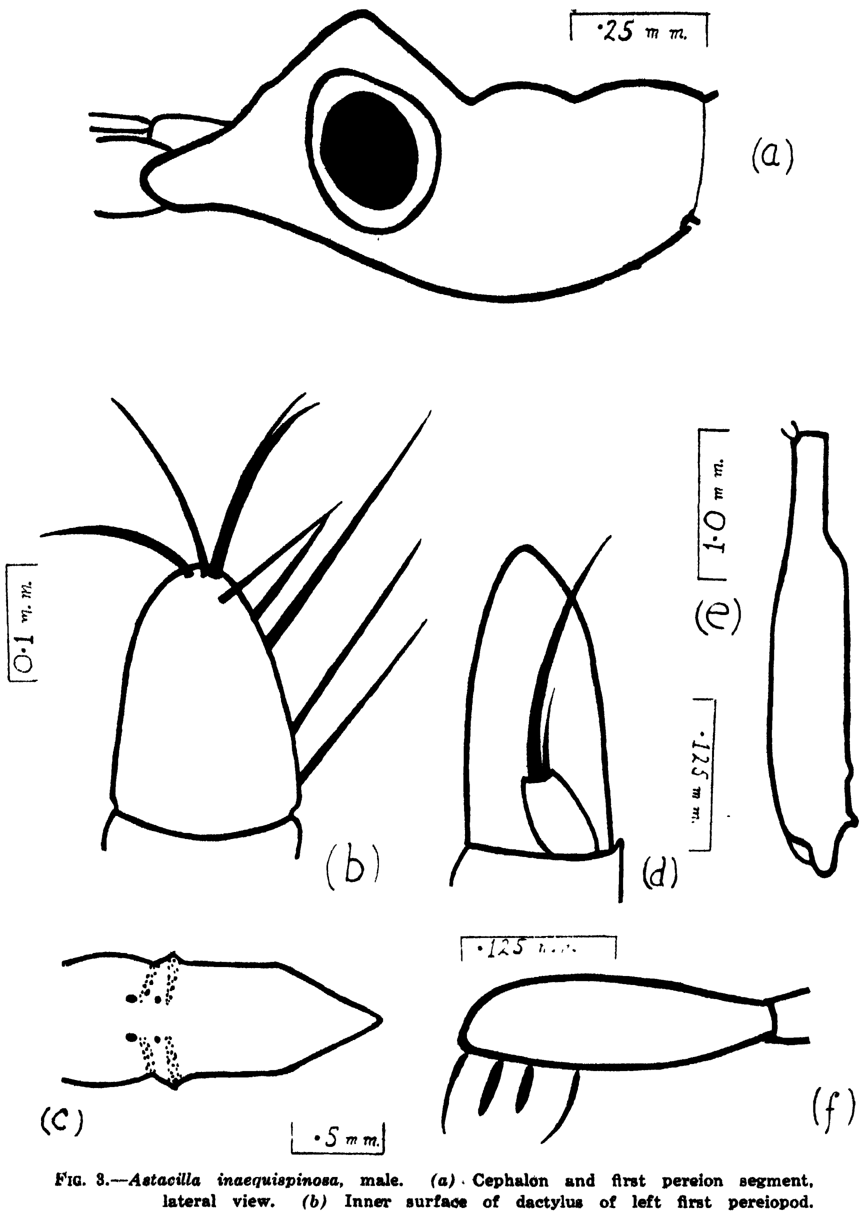

FIG. 3.—*Astacilla inaequispinosa*, male. *(a)* Cephalon and first pereion segment, lateral view. *(b)* Inner surface of dactylus of left first pereiopod. *(c)* Dorsal surface of the pleon. *(d)* Inner surface of right uropod. *(e)* Lateral view of IVth pereion segment. *(f)* Lateral view of first antenna.

of the cephalon and first pereion segment. The fourth pereion segment is much deeper posteriorly than anteriorly. It is longer than the length of the cephalon and the first three pereion segments and is nearly one-fifth of the overall length of the animal, fig. 3 (*e*). Postero-dorsally this segment bears a large, median slightly hooked spine. Just anterior to this spine is a low median elevation, also on the dorsal surface. Laterally and posteriorly are a pair of lobes which serve as articulation with the fifth pereion segment, there being an equivalent 'socket' on the anterior surface of the latter segment.

The fifth to seventh pereion segments are of relatively long nature, being almost one-half of the length of the fourth pereion segment.

The pleon is a quarter as long again as the length of pereion segments five to seven. The first and second abdominal segments do not show any sutures or grooves, but form a slight dorsal elevation. On the posterior dorsal surface of this elevation there is a pair of small tubercles. The third abdominal segment shows grooves on the dorsal surface demarkating it anteriorly from the second abdominal segment and posteriorly from the pleo-telson. A pair of tubercles occur on the dorsal surface of the third abdominal segment. They are smaller than those on the preceding segments, fig. 3 (*c*). The pleon tapers to a slightly pointed end.

The first antenna is short, the flagellum not reaching beyond the distal end of the first peduncular segment of the second antenna. The flagellum bears one sub-terminal and three ventral sensory appendages, fig. 3 (*f*).

The second antenna is very long, being almost one-third of the total length of the animal. The ratios of the lengths of the segments of the second antenna, reading inwards from and including the 'claw', are 1 : 1·25 : 1·75 : 1·5. The 'claw' on its inner margin bears a single row of minute sharp teeth of a simple conical pattern. These teeth extend from the proximal end of the segment to a short distance from the distal end of the segment. This distance from the distal end is approximately one-twentieth of the length of the segment. These teeth number 110.

The dactylus of the first pereiopod bears nine strong setae, all of which are concentrated on the outer surface, fig. 3 (*b*). Two of the setae are close together and might be regarded as a 'claw'. One seta is longer than the others and might likewise be regarded as a 'claw'. In my opinion none of the setae are sufficiently differentiated to be regarded as a 'claw'.

The fifth, sixth and seventh pereiopods do not bear claws, and the coxal plates of these segments are visible from the dorsal surface.

The secondary ramus of the uropod bears two setae. One of these setae is very large and extends beyond the end of the other ramus while the second seta is less than one-half of the length of the former. In this feature the species resembles *Astacilla fusiformis*, Hale.

Dredged in ten fathoms. D'Entrecasteaux Channel, January, 1948. Among red weeds.

Female

Body broader than the male. Total length 27·5 mms.

The cephalon is similar to that of the male but the eyes are sub-triangular. The groove separating the first pereion segment from the cephalon is much more developed than in the male.

The second and third cephalon segments are only one-half of the length of the cephalon and the first pereion segment. The fourth pereion segment is broader than in the male but is long in proportion to the total length of the animal, being slightly greater than one-third of the total length of the animal. The slight ridge, which in the male is anterior to the dorsal hook-like spine, is absent in the female. The spine is present and of the same form.

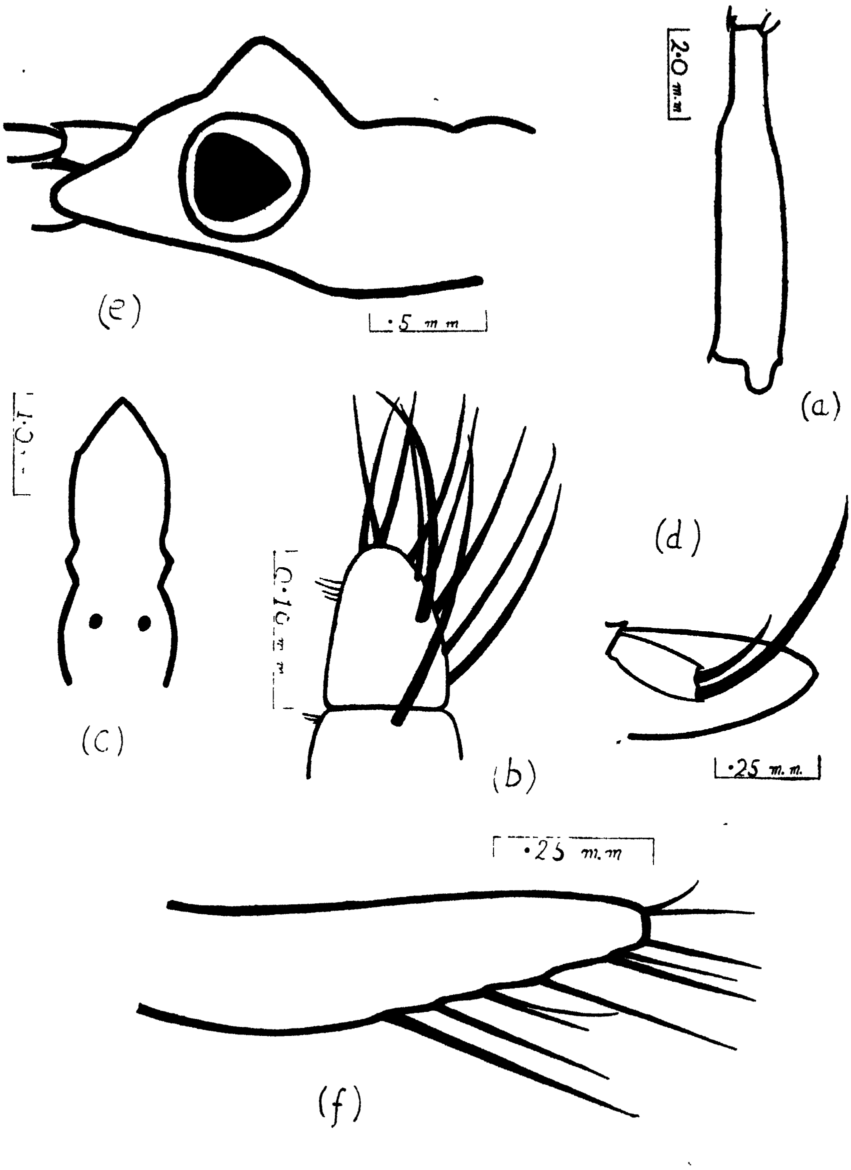

FIG. 4.—*Astacilla inaequispinosa*, female. *(a)* Lateral view of IVth pereion segment. *(b)* Inner surface of dactylus of left first pereiopod. *(c)* Pleon, dorsal view. *(d)* Inner surface of left uropod. *(e)* Lateral view of cephalon and first pereion segment. *(f)* Lateral view of flagellum of first antenna.

The fifth pereion segment bears a single median dorsal spine of similar form to that borne on the posterior end of the fourth segment. The spine on the fifth pereion segment is smaller than that on the fourth.

The pleon is similar to that of the male but is not as long in relation to the total length of the animal. In the male the pleon is one seventh of the total length while in the female it is only one-eighth of the total length.

The first antenna is short and bears the same relationship to the segments of the second antenna as in the male. The flagellum bears two terminal sensory appendages and eight ventral and sub-terminal sensory appendages fig. 4 (*f*).

The second antenna is slightly more than one-third of the total length of the animal. The ratios of the segments are the same as in the male with the exception that the 'claw' is slightly longer. The 'claw' is composed of three segments as in the male. It also bears a single row of simple conical teeth, 110 in number. In the female some of the teeth had been broken and the number of teeth must only be considered as approximate.

The dactylus of the first pereiopod bears ten setae on the outer side. None of these setae are smaller than the dactylus. On the inner side four small thin hair-like setae project vertically from the surface of the limb. There are three similar setae on the outer distal end of the propodite. None of the setae are sufficiently enlarged to be described as a claw. The distal end of the propodite bears a long seta which might be regarded as a claw. Fig. 4 (*b*).

The setae borne by the 'secondary' ramus of the uropod are much longer and stronger than in the male. They are so strong as to be described as spines. They are more curved than in the male, but the proportion of their lengths is the same as for the former sex.

The distribution of the pigment is the same in both sexes. In the cephalic region an area below the eye and on the lateral surfaces of the dorsal projection are pigmented. The anterior region of the fourth pereion segment and two spots in the mid-lateral region of the fourth pereion segment are also pigmented. The posterior end of the fourth pereion segment and the anterior of the fifth pereion segment are covered by a large area of pigment. The lower lateral surfaces of the sixth and seventh pereion segments are pigmented as in the lower lateral surface of the second abdominal segment and the lateral region of the posterior end of the animal.

This colour system is in no sense a characteristic of the species. *Astacilla derwenti*, described below, has the same system of pigmentation.

On comparison with the features of Neastacilla, Astacilla inaequispinosa furnishes several interesting observations. Firstly, the cephalic groove is not missing dorsally. In Nordenstam's diagnosis of the genus Neastacilla the groove is missing dorsally. The lack of an expanded part of the first pereion segment is a Neastacillid feature, as is the absence of a 'claw' on the dactylus of the first pereiopod. The possession of two setae on the secondary ramus of the uropod is Astacillid in nature, while the abdomen only shows two external grooves.

Dredged in ten fathoms, D'Entrecasteaux Channel, January, 1948.

Astacilla unicornis, sp. nov.

(Fig. 5)

This species is described as a new species with some doubt as I have only the female on which to base a description. The specimen cannot be assigned to any described species, and in view of the great sexual dimorphism exhibited by other species of this genus it is only a tentative description here attempted.

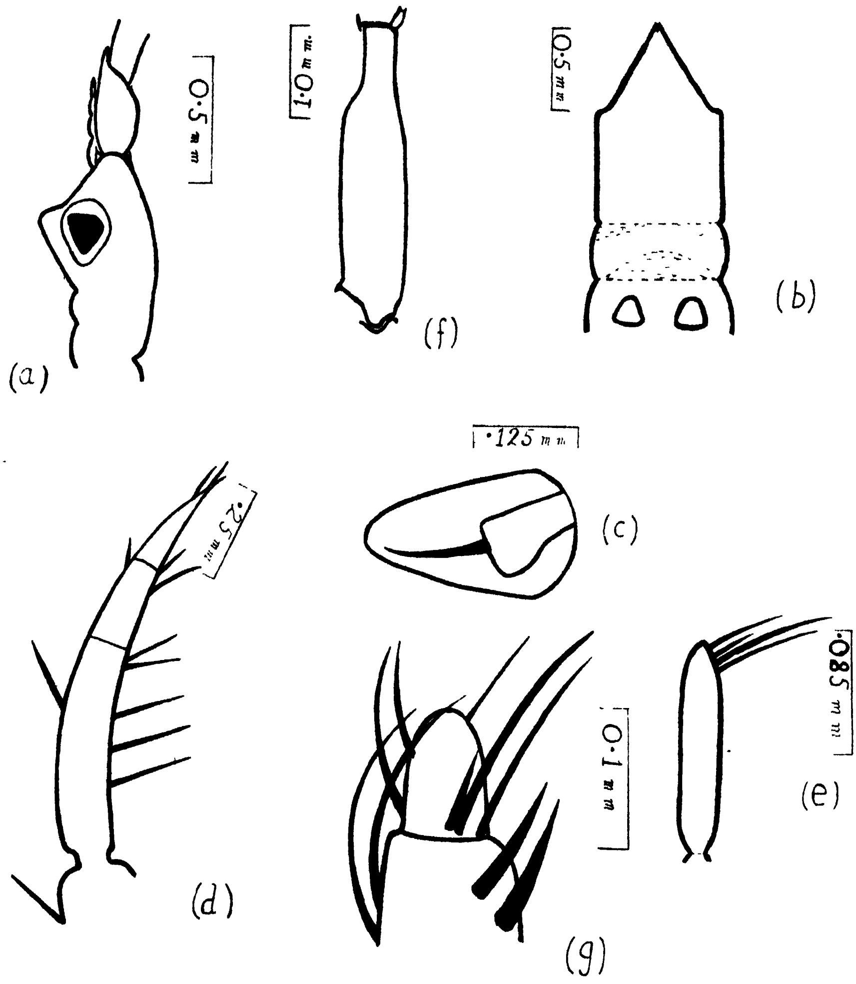

Fig. 5.—*Astacilla unicornis*, female. *(a)* Lateral view of cephalon and first pereion segment. *(b)* Pleon, dorsal view. *(c)* Inner surface of left uropod. *(d)* Lateral view of 'claw' of second antenna. *(e)* Dorsal view of first antenna. *(f)* Lateral view of IVth pereion segment. *(g)* Dactylus of left first pereiopod.

Female

Body broad, surface smooth. Total length 14·00 mms.

The dorsal cephalic surface bears a large median process similar to that of *A. inaequispinosa.* There is a very small median anterior projection of the cephalon. The eyes are smaller than in any preceding species and are sub-triangular in shape. The cephalon is separated from the first pereion segment by a fairly sharply defined dorsal groove. There is slight lateral expansion of the first pereion segment to cover the mouth parts.

The second and third pereion segments are short, being only one-half the length of the cephalon and the first pereion segment.

The fourth pereion segment is narrow anteriorly but becomes deeper about one-quarter of its length, fig. 5 *(j).* Postero-dorsally it has a hooked, median spine, as in *Astacilla inaequispinosa.* A median lobe of the fourth pereion segment articulates with a socket on the anterior surface of the fifth segment.

The fifth to seventh pereion segments are long in relation to the total length of the animal, being one-eighth of that length. This is different from most other species described in this paper in which the length of the segments is about one-ninth of the total length.

The first two abdominal segments are fused as in *A. inaequispinosa* but in this species the fused segments bear a pair of blunt tubercles. The third abdominal segment is indicated by grooves on the dorsal surface. The posterior extremity of the pleon is faintly incised.

The first antenna is short, the flagellum not reaching beyond the first peduncular joint of the second antenna. The flagellum bears four long sub-terminal sensory appendages.

The second antenna is long, being nearly one-third of the total length of the animal. The ratios of the segments reading inwards from and including the 'claw' are 1·5 : 1·75 : 1·25 : 1·00. The 'claw' on its inner surface bears a single series of minute teeth. The teeth are of a recurved conical pattern. The row of teeth commences at the distal end of the 'claw' and ends three-quarters of the length along the 'claw'. The 'claw' is composed of three segments, fig. 5 *(d).* There are 60 teeth.

The dactylus of the first pereiopod has six setae. Two of these are on the outside of the limb and are the same size as the dactylus. The other four are of varying sizes and all on the inside of the dactylus, i.e., point towards the mouth. Of these four one is of sufficiently large size to be called a claw. The propodite bears on its inner surface many strong, spinous setae, fig. 5 *(g).*

The coxal plates of the pereiopods are not visible from the dorsal surface. Pereiopods five to seven are not clawed. The secondary ramus of the uropod bears one strong spine, which reaches almost to the end of the lateral ramus.

Dredge, D'Entrecasteaux Channel in ten fathoms, January, 1948.

This species, from the appearance of the female, again gives interesting results if compared with Nordenstam's diagnosis of the genus Neastacilla. The features of the latter genus to be seen are lack of expansion of the first pereion segment and the possession of the long apical seta on the secondary ramus of the uropod. Features of the genus which are absent or exist in modified form are . . . the groove separating the cephalon from the first pereion segment is present dorsally, the abdomen has only two shallow grooves and one of the setae on the dactylus of the first pereiopod is enlarged and could be described as a 'claw'.

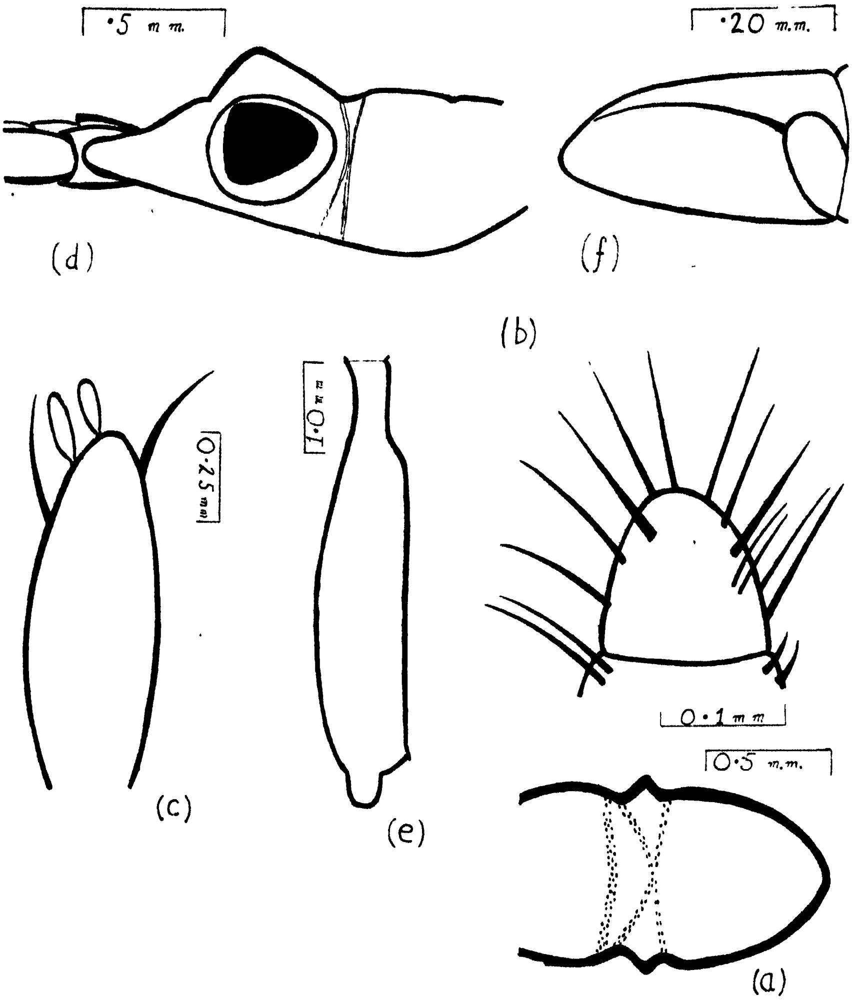

FIG. 6.—*Astacilla derwenti*, female. *(a)* Dorsal view of pleon. *(b)* Outer surface of dactylus of left first pereiopod. *(c)* Lateral view of first antenna. *(d)* Lateral view of cephalon and first pereion segment. *(e)* Lateral view of IVth pereion segment. *(f)* Inner surface of left uropod.

Astacilla derwenti, sp. nov.

(Fig. 6)

The same remarks as to the description of the species applies to this species as to *A. unicornis.* This species is known only from the female.

Female

Body smooth, form similar to *Astacilla inaequispinosa.* Total length 18·25 mms.

Large median projection on the dorsal cephalic surface between the eyes. Small antero-median projection of the cephalon. Eyes are large and sub-triangular.

The cephalon is separated from the first pereion segment by a groove which is present dorsally and absent laterally and ventrally. There are slight lateral extensions of the first pereion segment.

The second and third pereion segments are of moderate length being three-quarters of the length of the cephalon and the first pereion segment (as in *A. inaequispinosa*).

The fourth segment of the pereion is long and deep posteriorly and it is nearly one-third of the total length of the animal. Posteriorly and dorsally this segment has a short blunt spine. This spine is of a different form from that of the preceding species. A postero-lateral lobe of the segment articulates with a socket of the fifth pereion segment. The lobe resembles that of the male *Astacilla inaequispinosa.*

The fifth to seventh pereion segments are more than one eighth of the total length of the specimen. In none of these segments can the coxal plates be seen from a dorsal position.

The pleon is slightly longer than the fifth to seventh pereion segments. It has a pair of lateral processes. It is rounded posteriorly. The abdominal segments are distinguished by dorsal grooves. The first abdominal segment is larger than the second or third. There are no tubercles on the abdominal segments.

The first antenna is short, the flagellum just reaching to the end of the first peduncular segment of the second antenna. The flagellum bears one dorsal and one ventral process and two sub-terminal processes, fig. 6 (*c*).

The second antenna is long being over one-third of the total length of the animal. The ratios of the segments reading inwards from and including the 'claw' are 1 : 1·75 : 2·25 : 1·5. There are no teeth on the 'claw'.

The dactylus of the first pereiopod, fig. 6 (*b*), bears five setae on the outer surface and seven setae on the inner or oral surface. The setae, with the exception of two, are all sub-equal. The two exceptions are smaller than the rest. The propodite bears on its inner surface a row of strong short spines similar to those on the same segment in *Astacilla unicornis.* The spines are shorter than in the latter species.

The fifth to seventh pereiopods are not clawed.

The secondary ramus of the uropod is of oval form and bears one long slender apical seta.

Dredged in ten fathoms, D'Entrecasteaux Channel, January, 1948.

This specimen bears a number of resemblances to the female described above and tentatively assigned to *Astacilla unicornis*, but agrees more fully with the diagnosis of Neastacilla. The only feature of Neastacilla which the specimen does not possess is that the groove separating the cephalon from the first pereion segment is present dorsally. Were the genus Neastacilla valid this specimen would have been assigned to that genus.

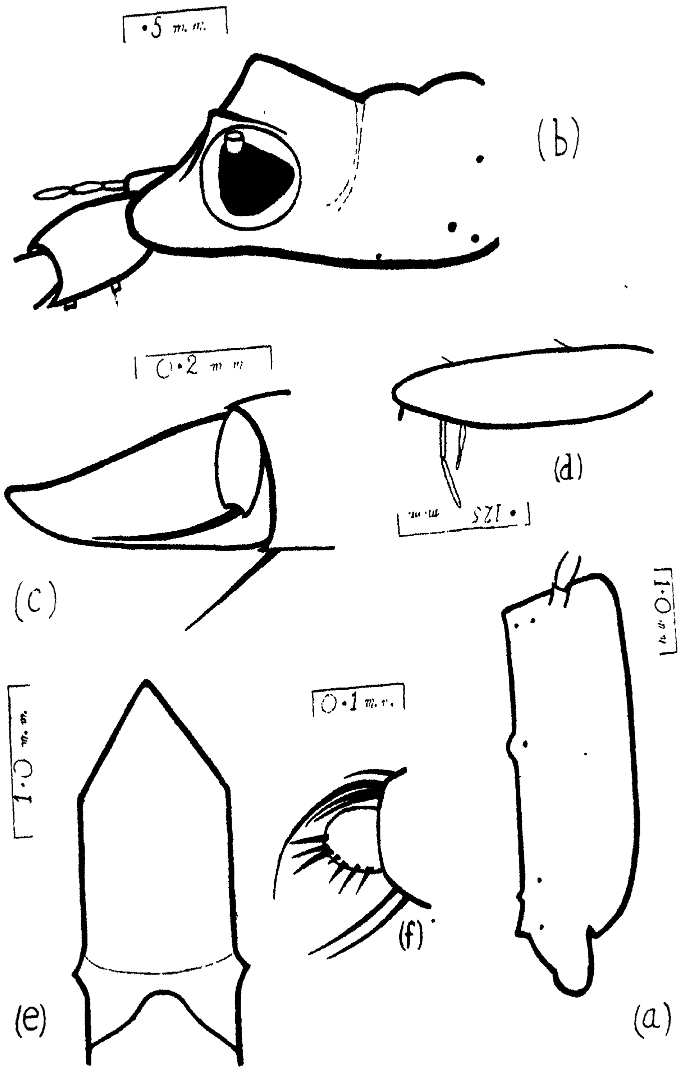

FIG. 7.—*Astacilla oculata*, female. *(a)* Lateral view of IVth pereion segment. *(b)* Lateral view of cephalon and first pereion segment. *(c)* Inner surface of right uropod. *(d)* Lateral view of flagellum of first antenna. *(e)* Pleon, dorsal view. *(f)* Dactylus of right first pereiopod.

Astacilla oculata, sp. nov.

(Fig. 7)

Known only from the female.

Body sparsely tuberculated, stout. Total length 19·5 mms. Large median dorsal cephalic projection. On either side of this are two smaller projections situated above the eyes. Several small tubercles are scattered over the general surface. There is a very slight median anterior projection of the cephalon. The eyes are large. The pigmented area is sub-triangular while the non-pigmented area is sub-circular. The pigmented area bears on the dorsal side a large tubercle.

The cephalon is separated from the first pereion segment by a dorsal groove. The segment bears three lateral tubercles. There is slight lateral downgrowth of the segment.

The second and third pereion segments are short, being less than one-half of the length of the cephalon and first pereion segment.

The fourth pereion segment is broad, bearing several small tubercles on the dorsal surface. In general form it resembles that of Astacilla sheardi, Hale, but is much deeper. At an approximate mid-dorsal position there is a low ridge. There is a postero-dorsal process. This process is not sufficiently sharp to be described as a spine. Immediately anterior to this process is a low sharp spine. Paired lateral lobes of the fourth pereion segment articulate with sockets in the anterior face of the fifth pereion segment. The fourth pereion segment is nearly one-quarter of the total length of the animal, fig. 7 (*a*).

The fifth to seventh pereion segments are broad in appearance and measure four-fifths of the length of the pleon.

The first two abdominal segments do not show any external evidence of segmentation. The segmentation of the third segment is only faintly visible on the dorsal surface. The pleon tapers to a point, fig. 7 (*e*).

The first antenna is short the flagellum not reaching the end of the first peduncular segment of the second antenna. The flagellum bears two fine dorsal setae and one sub-terminal and two ventral sensory appendages, fig. 7 (*d*).

The second antenna is not quite one-third of the total length of the specimen. The ratios of the segments reading in from and including the 'claw' are 1·25 : 2·0 : 2·25 : 1·5. The 'claw' on its inner surface bears a single row of minute teeth. They are of a recurved conical nature. The teeth number 120. The first peduncular segment of the second antenna bears on its ventral surface two rectangular processes. One of these has two very fine sensory hairs protruding from it. The other lacks these hairs, but it is possible that they were damaged either in life or in preservation.

The dactylus of pereiopod of the first pereion segment bears on its outer surface seven short, strong spinous setae. The inner surface is devoid of setae. One of the setae on the propodite is very long and curves over the dactylus, fig. 7 (*f*).

Pereiopods five to seven are not clawed. The coxal plates of all the thoracic limbs are not visible dorsally.

The 'secondary' ramus of the uropod bears one curved spine which is three-quarters of the length of the lateral ramus.

Dredge, D'Entrecasteaux Channel, January, 1948. Ten fathoms on scallop grounds on shelly bottom.

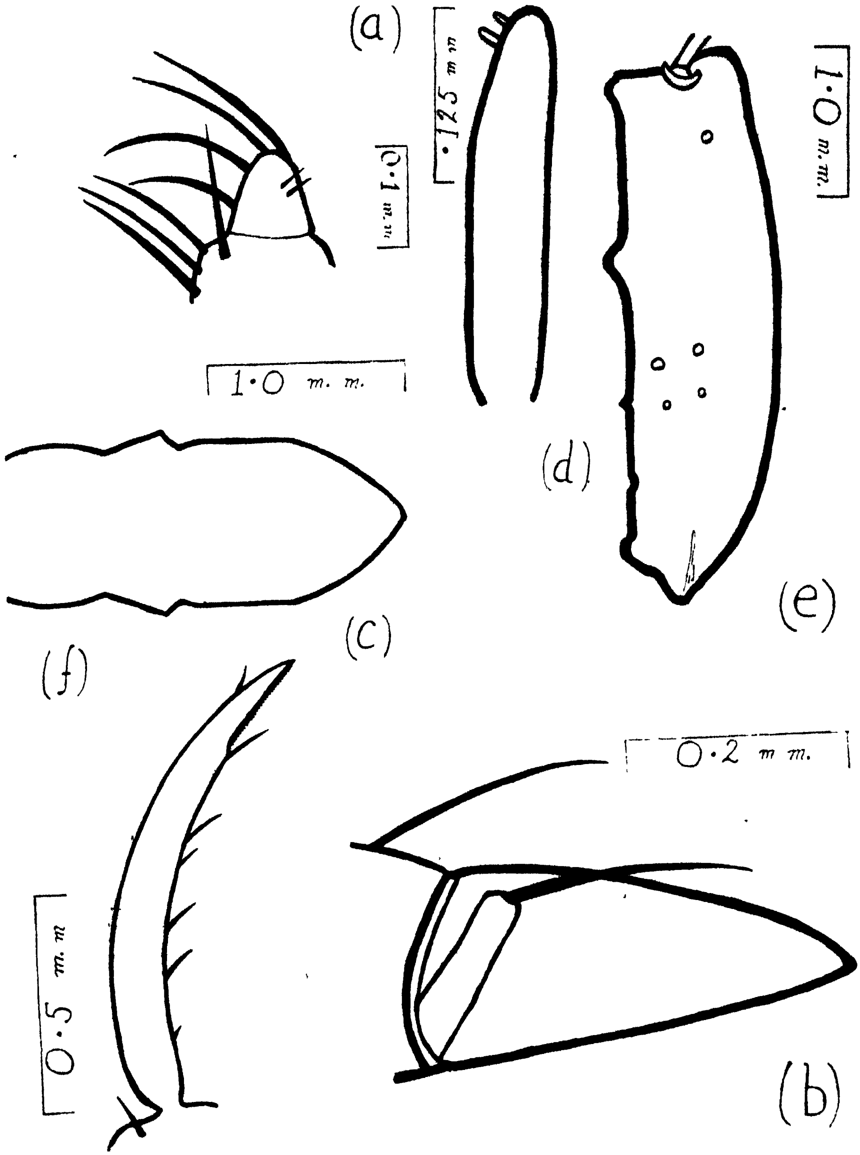

FIG. 8.—*Astacilla oculata*, young female. *(a)* Dactylus of the left first pereiopod. *(b)* Inner surface of right uropod. *(c)* Dorsal surface of pleon. *(d)* Lateral view of flagellum of first antenna. *(e)* Lateral view of IVth pereion segment. *(f)* Lateral view of 'claw' of second antenna.

On the condition of the dorsal groove separating the cephalon and the first pereion segment and the condition of the abdominal grooves this specimen differs from the diagnosis of Neastacilla. The dactylus of the first pereiopod shows an interesting condition in which the setae are modified to form a number of spines. None of the setae are sufficiently modified to be regarded as a claw, unless the setae may be considered as claws.

Young female, fig. 8.

This specimen closely resembles the above that I believe it to be a young female of the species. If it is another species it must be very close to *Astacilla oculata.*

Total lengths of specimen 16·75 mms. General form very much as described above.

The tubercle on the dorsal surface of the eye is much smaller than in the female described above. There is a pair of small lateral tubercles on the second pereion segment. The relation of the length of the cephalon and first pereion segment to the length of the second and third segment are the same as above.

The fourth segment is of similar form but varies in the position of the tubercles, spines and ridges. The posterior process is blunt and flat on the dorsal surface. Anterior to the posterior process on the dorsal surface is a median groove, while approximately half-way along the dorsal surface of the segment is a sharp spine.

The sixth pereion segment has a pair of sharp dorsal spines.

The ratios of the segments of all the limbs are identical to those noted in the adult female. The first antenna has two sub-terminal sensory appendages, fig. 8 (*d*). The second antenna is of the same proportions as in the adult female and also bears teeth of the same form and number as the adult. In the diagram (fig. 8 (*f*)) only the teeth at the end of the 'claw' are shown.

The dactylus of the first pereiopod has four long setae on the outer surface and on the inner surface two short spinous setae. The propodite bears a long spine.

The 'secondary' ramus of the uropod bears one long seta but the ramus is of different form than in the adult female.

The only difference in the measurements of the body is that the fourth pereion segment is one-fifth of the total length of the specimen.

Dredge in ten fathoms, D'Entrecasteaux Channel, January, 1948.

Discussion

A comparison of the known species of Astacilla and Neastacilla with the restricted diagnosis of the genus Neastacilla as given by Nordenstam yields many interesting points.

Doubts as to the validity of *Neastacilla* were cast by Nordenstam (1933) and later by Hale (1946) who remarked that he could see no valid reason for the genus, but as yet no critical work has appeared considering each point of the generic diagnosis in relation to present species. The lack of this criticism was probably due to the absence of intermediate species connecting the two genera, but the recent discovery last January of new species enable this work to be undertaken now with a greater degree of accuracy.

The genus *Neastacilla* was defined by Tattersall (1921) as follows: 'II Thoracic somite fused with the head and its lateral parts are not expanded downwards and forwards to cover partially the mouth organs. The abdomen is unsegmented, all the segments being fused into one piece'. Only two species were assigned to the genus, *falclandica* and *magellanica*, Ohlin, whose specific names give their localities.

This diagnosis was modified by Nordenstam 1833, to read 'first pereion segment coalesced with the head but separated from the head by a mère groove which is sometimes missing dorsally. Lateral parts of the 1st. pereion segment not expanded downwards and forwards. Abdomen with three segments indicated by shallow grooves, anteriorly from the pleotelson. Dactylus of first pereiopod not expanded tapering towards end; "claw" missing. "Secondary" ramus of uropod furnished with a very long apical seta'. To this modified genus was added *amblyura* Stebbing (1905).

Astacilla was defined by Cordiner (1795) Singular Subjects of Natural History, and I shall point out salient features of this diagnosis later.

Nordenstam pointed out that, 'most species referred to *Astacilla* are imperfectly known as regards characteristics which are distinctive of *Neastacilla*'. It may therefore be asked whether there may not be some species intermediate betwen *Astacilla* and *Neastacilla*, thus perhaps rendering the genus *Neastacilla* superfluous.

Before proceeding to discuss the criticisms of recent workers levelled at the diagnosis of *Neastacilla*, it will be of assistance in clarifying the arguments if the salient features of each species be set out in tabular form.

	Neastacilla.	*Astacilla.*
a. Cephalic-thoracic Relationships.	Grooved.	f. Sutured.
b. First thoracic segment.	No lateral downward expansion.	g. Lateral & downward expansion.
c. Dactylus of first Thoracic Limb.	Tapering, clawless.	h. Blunt, clawed.
d. Three Antèrior Abdominal segments.	Indicated by grooves.	i. Separate.
e. Secondary ramus of uropod.	1 long apical seta.	j. 2 seta.

The species mentioned previously as being recently discovered were dredged in eight fathoms in the D'Entrecasteaux Channel, living on red weeds. They were described under the names of *A. monoseta*, male and female; *inaequispinosa*, male and female; *unicornis*, female; *derwenti*, female; and *oculata*, female.

Considering the table point by point in light of previous criticisms based on the then known species and these described lately, we note the following—

a. Cephalic-thoracic Relationships

Nordenstam states that this is only minute difference and may vary in different species; and he considered it to be of little diagnostic importance. In *A. Monoseta*, the groove separating these parts of the body exhibits a certain sexual difference being more strongly developed in the female than in the male. As we shall see later, this species exhibits features a, g, c, i and e. This sexual dimorphism can be seen in *A. inaequispinosa*, which shows a, slightly, b; c or h; d:

j. a, slightly, in the latter species refers to fact that the groove is only very faintly present. In *A. algensis*, Hale, the groove appears to be absent dorsally yet this species shows j.

At the other extremes in *A. longicomis*, Sowerby, we see that the suture described in the diagnosis of the genus *Astacilla.*

This feature is very unstable as it can exist very well defined through stages to more or less absence at the same time the various species bearing mixed generic features.

b. First Thoracic Segment

Quoting Nordenstam 'in some species of *Astacilla* these expansions—judging by the literature on the subject—appear to be indistinct or quite absent'. This can be seen in such species as *A. mediterranea*, Kochler, and *A. deshaisii*, Stephenson, which were nevertheless, assigned to the genus *Astacilla.*

This expansion can exist side-by-side with Neastacillid conditions, as is seen in *A. monoseta*, where we find a, g, c, d, and e.

From the above therefore, I conclude that this feature must only rank after specific and not generic diagnosis.

c. Dactylus of First Pereiopod

I cannot agree with Nordenstam on this feature being diagnostic. My principal reason for this is that the feature as defined after Astacilla exists beside Neastacillid features. *A. unicornis* possess features a; b; h; d; and e. One seta in this species is of sufficient size to be called a 'claw'.

Study of the illustrations of various authors shows that a certain amount of difference of opinion exists as to what may be called a 'claw'.

d. Condition of the Three Anterior Abdominal Segments

This feature was discarded by Nordenstam on the conflicting evidence shown by *A. longicornis*, Sowerby, and Tattersall's type figures for Neastacilla. In the specimens I examined there was a uniformity of this feature, that there is not sufficient data of the species to decide if a genus might be erected on this feature. I doubt if it might as, I believe it to be more in the nature of a feature common to the genus *Astacilla* but, similar to the sephatic thoracic relationships, in varying states of development.

e. Setae on Secondary Ramus of Uropod

The Astacillid feature of two setae in the secondary ramus of the uropod exists beside Neastacillid features in *A. inaequispinosa*, though the converse condition is not to be seen in any described species. This may be altered as the uropod has not been described in *A. marionensis*, Beddome and Kerguelensis, Vanhöffen. *A. monoseta* shows the single seta and other Neastacillid features and at the same time shows Astacillid feature in lateral and downward expansion of the first thoracic segment. It might seem that further Astacillid features may be found in some as yet undiscovered species.

There exists a series in the relative sizes of the setae on this ramus of the uropod. Starting with equal sized setae, as in *A. vicaria*, Hale, through the subequal condition seen in several species, to next stage where one seta is half of the length of the other as in *inaequispinosa* and *fusiformis*, Hale, followed by that seen in *amblyura*, Stebbing, where a rudimentary seta exists beside the large single seta to the end point of one single seta.

From the above comparisons it seems certain that Nordenstam's cautious remark that the genus *Neastacilla* might be rendered superfluous, has been verified not only by the recently discovered species from the channel but also by the longer known and described species from other localities.

Sexual dimorphism exists in other Isopods—notably—Naesa bidentata Bate and Westwood where the male and female were described as different species. In *A. monoseta* and *inaequispinosa* I have described what I consider to be the male and female of both species. In *monoseta*, I have used limb proportions as a guide as external appearances are very different. In *inaequispinosa* there is little dimorphism.

I must acknowledge the helpful advice and assistance of Professor V. V. Hickman during the preparation of this paper.

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Notes on the Geographical Races of Hesperilla Chrysotricha Meyrick and Lower (Lepidoptera-Hesperiidae)

By

L. E. COUCHMAN

PLATE I

A previous note (Couchman, 1947) reported the capture of specimens of both sexes of a race of *Hesperilla chrysotricha* M. and L., 1902, from Lunawanna, South Bruny Island, which I ascribed to ssp. *plebeia* Waterhouse. Twelve months later, A. M. Hewer presented to the Tasmanian Museum several worn specimens of a form of *chrysotricha* taken on 25th January, 1948, at Lutana, a riverside suburb of Hobart. In company with S. Angel a search was made of the western shores of the Derwent near Lutana, and a colony of this butterfly was found, of all places, on a City Council rubbish tip. A number of pupae were collected from clumps of *Cladium filum*, R.Br., from which ten females and two males emerged.

The differences in colour, markings and food plant when compared with the South Bruny specimens pointed to the existence in Tasmania of more than one race of *chrysotricha*. With the realisation that we had two distinct forms existing in Tasmania it became necessary to compare our material with the holotype male of ssp. *plebeia* in the Australian Museum, this comparison showed that Waterhouse's type was similar to the form discovered on the western banks of the Derwent, not to the specimens from Lunawanna, so that a correction is necessary to my earlier notes. As a result of the investigations of ourselves and others whose help has been enlisted in the search for further material, it has been possible for me to study specimens from several Tasmanian localities in some numbers, and thanks to the field work of F. M. Angel and N. B. Tindale I have seen more material from South Australia than was available to earlier writers, which has enabled me to separate as distinct a race from South Australia and another race from South Bruny.

As I noted in 1947, Waterhouse (1932*b*) used G. H. Hardy's Latrobe record for ssp. *plebeia* while apparently overlooking the fact that Hardy had recorded the capture of a female, so although it seems certain that Waterhouse actually had this specimen of the female, taken by Hardy, in his own collection, the published notes (1927, 1932*b*) refer to males as the only sex then known.

Curiously enough, while working through the *Hesperilla* material in the Waterhouse collection, my wife discovered the actual female taken by Hardy in 1915, which is recorded (1918) in these Papers and Proceedings for 1917, p. 67. The specimen carried three labels, the original, 'G. H. Hardy, Latrobe 1-1-15'; a second, 'Presented by G. H. Hardy C1055'; the third, 'Belongs to Hobart Museum'. G. H. Hardy *(in litt.)* informs me that this specimen, the only lepidopteron taken during one day's collecting at Latrobe, was donated to the Tasmanian Museum under the name of '*H. cyclospila*', and that Waterhouse must

have secured it after he (Hardy) left Tasmania in 1918. Thus it seems reasonably certain that Waterhouse had this female in his collection, under the name of the Port Phillip race, at a time when according to his published notes only the male of the race from Tasmania was known. This specimen has been returned to the Tasmanian Museum, and I describe it as the neallotype female of ssp. *plebeia* Waterhouse (1927), since it agrees with the race which we have now proved extends from south of Hobart along the western shores of the Derwent and the eastern and northern coasts of Tasmania.

The South Bruny specimens discovered in 1947 are recognisable as a distinct geographical race, much closer in appearance to the race here described from Port Lincoln, and to the typical ssp. *chrysotricha* from Albany, West Australia.

Hesperilla chrysotricha plebeia Waterhouse, 1927

H. chrysotricha cyclospila Waterhouse and Lyell, 1914 (nec Meyrick and Lower, 1902) Butt. Australia: 188 (part); 34, f. 632. *Hesperilla cyclospila* Hardy, 1918, Pap. Proc. Roy. Soc. Tasmania, 1917: 67. Turner, 1926, op. cit., 1925: 123. (nec *H. chrysotricha plebeia* Waterhouse, Couchman, 1947).

This race was described from two males, now in the Waterhouse coll., bearing labels 'Bridport, Tas. 27th Dec. 1902 H. L. Latta'.

Female. Forewing above, mummy-brown (Ridgway 15); cell spot and discal spots in areas 1*a*, 2 and 3 of equal size, a minute dot in upper half of 1*a*, light orange-yellow (Ridgway 3); three subapical spots of equal length, white, hyaline; cilia pale ochraceous-buff (Ridgway 15). Hindwing, as forewing; a central patch 4·5 mm. long, 2 mm. wide, deep chrome (Ridgway 3); cilia as forewing.

Beneath; apex of forewing and the hindwing warm buff (Ridgway 15); inner margin of hindwing broadly cream-buff (Ridgway 30); cell spot silver centred; a discal row of silver centred spots, that in area 6 twice as large as those in 2, 3 and 7; a faint elongate black dot in disc of area 5. Cilia as above.

Forewing length 17·5 mm.

Neallotype female labelled 'G. H. Hardy, Latrobe 1-1-15'; now in the Tasmanian Museum.

I have records of this race, mostly bred from pupae, from the western shores of the Derwent (Margate, Kingston, Lutana, Elwick to Granton, Bridgewater turn-off to the 19-mile post near New Norfolk); Carlton (N. B. Tindale); several spots near Swansea (S. Angel); as well as the earlier records from Bridport and Latrobe.

Whereas the Lunawanna race of the butterfly, as noted in 1947, was attached to *Gahnia trifida* Lab., the only food plant at Lutana proved to be *Cladium filum* R.Br. In company with my friend A. Meston, my wife and I made an intensive search of the western shores of the Derwent during December, 1948, in an effort to check the range of the foodplant, and, it was hoped, of the butterfly. From Kingston to the 10¾-mile post at Granton, the only plant to be found was *Cladium filum* R.Br., always within a few yards of the shore line, often rooted below the tidal level of the river, and usually consisting of a single line of plants fringing the river edge. We found the early stages of the butterfly in every locality throughout this reach of the river, and although owing to its position at Lutana it faces extermination there within a few years, there are a number of other spots near Hobart in which ssp. *plebeia* should be able to survive.

From Granton westwards there is a complete break in the food plant, no *Cladium* was found; but from the 13-mile post at least to the 19-mile post near New Norfolk *Gahnia trifida* Lab. alone is to be found, usually well back from the river edge,

bordering the swamps that are to be found along this stretch of the Derwent. It would seem that the salinity of the river must govern the extent of the two species of swordgrass, since no *G. trifida* was found from Lutana to Granton, and no *C. filum* between the Bridgewater turn-off and New Norfolk.

Because the correct determination of these foodplants seemed important, specimens were submitted to Miss W. M. Curtis, and on her advice to S. T. Blake, of the Botanic Museum, Brisbane, to whom I am indebted for help in the final determination of Tasmanian and South Australian plant material. *In litt.* my friend notes that '*G. trifida* and *C. filum* have been much confused. Kükenthal . . . has recently treated *Cladium filum* as a species of *Gahnia*, and I think this is the best disposition of the species. It is closely similar to *Gahnia trifida* and does not closely resemble any undisputed species of *Cladium*'.

Nevertheless, ssp. *plebeia* was found wherever we searched on either foodplant along the Derwent, and the specimens subsequently bred from pupae taken from *G. trifida* and *C. filum* are indistinguishable from the specimen taken by Hardy at Latrobe.

This race has been noted, from captured and bred examples, as emerging from 27th December, Bridport (H. L. Latta); 1st January, Latrobe (G. H. Hardy); 7th January, Lutana (L. E. Couchman); to 23rd February, Lutana (S. Angel).

Until the third instar the larva lives in a slender straight shelter, about three inches in length, formed from the tips of two or at most three leaves of its foodplant; after this it spins a spiral shelter lower down in the plant four inches or more in length, in which three, four or even five leaves may be incorporated, one leaf being looped over and woven into the shelter in a quite distinctive manner. The larva feeds at night on the tips of the leaves it has spun together, eating its way back towards the shelter.

The third instar larva from *G. filum* at Margate on September 4th was noted as being light yellowish-green in colour, lightening to yellowish at the joints of the segments, a darker green dorsal line, the body and anal plate covered with thinly scattered short black hairs. Head 3 mm. long, 2 mm. wide, buff, shading to greenish-buff towards the collar, central cleft black, thoracic legs brown, prolegs flesh coloured. Of the five larvae examined, two were 20 mm. in length, the other three, one of which had just shed its skin, 17 mm. in length. The full fed larva differs only in size, a specimen from Swansea taken on September 18th (an unusually early date, even for the East Coast) was 40 mm. in length, the head 4·5 mm. long, 3·5 mm. wide, in colour and marking agreeing with specimens from the Derwent estuary.

Although the larva usually lives, and later pupates, head upwards, this is by no means always true. My wife and I examined 68 larvae at Prince of Wales Bay, Hobart, on September 20th, 1948, of which seven were head down in their shelters, the rest head upwards as usual. Our count showed roughly every tenth larva head downwards, and this proportion has been noted on other occasions.

The larva lines the shelter with silk, and spins a pad to close the shelter above itself when ready to pupate, but there is a rather remarkable difference in the amount and quality of the silk lining the shelters found on the two foodplants in the Hobart district. On *G. filum* the shelter is thinly lined with silk, and the pupa rests with an appreciable amount of freedom within the shelter, but larvae on *G. trifida* spin a thick lining of tough silk, which enfolds the pupa so closely as to make movement difficult, and the removal of the pupa from its shelter without damage a somewhat delicate operation.

Hesperilla chrysotricha lunawanna n.ssp.

H. chrysotricha plebeia Waterhouse, Couchman, 1947 (nec Waterhouse, 1927), Pap. Proc. Roy. Soc. Tasmania, 1946: 29-30, I, f. 1-4.

Male and female are as described and figured in 1947, for comparison I now give a more detailed description.

Male. Forewing above mummy-brown (Ridgway 15), subapical spots white, hyaline; cell, and discal spots in areas 3 and 2, the latter half the size of the former, light orange-yellow (Ridgway 3); the sex brand composed of a series of crescents from vein 4 to below 1*a*. Hindwing as forewing, slightly darker in tone, the central patch extending towards the outer margin, 4 mm. long, 1·5 mm. wide, deep chrome (Ridgway 3). Cilia of forewing and hindwing pale pinkish-buff (Ridgway 29).

Beneath; apex of forewing and the hindwing snuff-brown (Ridgway 29), fold of hindwing cream-buff (Ridgway 30), cell spot silver centred, a discal row of brown spots, that in 6 silver centred.

Forewing length 15 mm.

Female. Forewing and hindwing above as in the male, three subapical spots of equal size, white, hyaline; cell and discal spots as in male, but the spots in areas 2 and 3 of equal size, and in addition a smaller spot in the lower half of 1*a*, light orange-yellow; cilia as in male.

Beneath; the apex of forewing and the hindwing tawny-olive (Ridgway 29), hindwing fold cream-buff; cell and discal spots of hindwing as in male, that in area 2 faintly, those in 3, 6 and in the cell clearly silver centred.

Forewing length 17 mm.

Holotype male and allotype female labelled 'Lunawanna, Tas. 12-Jan.-47 L. E. Couchman', in the Tasmanian Museum, paratypes in the Australian Museum, the South Australian Museum, and in my own collection. The name of this race forms part of the former aboriginal tribal name for the island.

I have captured and bred examples dated 12th January to 28th January, all from one locality on South Bruny Island; here, unlike ssp. *plebeia* in the Hobart district which is confined to an extremely narrow strip of the shore line, ssp. *lunawanna* ranges from the actual sea shore inland for several hundred yards.

Larvae and pupae have been taken only on *G. trifida* Lab. as previously noted, they are similar in every way to those of ssp. *plebeia* feeding on both *G. trifida* and *G. filum* in the Derwent estuary. At Lunawanna, as perhaps elsewhere, this butterfly survives despite very heavy losses in the early stages. During the first week in January, 1948, we examined 63 pupal shelters, of which 29 contained dipterous parasites, 30 pupae had been killed by a fungus disease, one pupa had emerged, and one shelter only was found to contain a live pupa.

Hesperilla chrysotricha naua n.ssp.

Telesto cyclospila Meyrick and Lower, 1902, Trans. Proc. Roy. Soc. South Australia, 26 (2): 63-64 (part); *Hesperilla cyclospila* Lower, 1911, *ibid.* 35: 121 (part); *Hesperilla chrysotricha cyclospila* Waterhouse and Lyell, 1914, Butt. Australia: 188-189 (part); Waterhouse, 1932, What Butt. is that?: 242 (part).

Waterhouse (1932*a*, 1933) discusses the Port Lincoln and Melbourne specimens first recorded by Meyrick and Lower in 1902, and restricts the name *cyclospila* to specimens from the eastern shores of Port Phillip. However, although he noted the differences between the Port Lincoln race and that from Port Phillip, Waterhouse did not name Lower's specimens from the former locality, and when describing the South Australian race (1938) attached the name *leucosia* to specimens from Mount Compass, leaving the race from Port Lincoln, which Meyrick and Lower in 1902, and later Lower (1911) had indicated as being distinct, still without a name. Actually the Port Lincoln specimens can be separated from the races taken elsewhere in South Australia and Victoria, as Lower believed; they are in fact much closer to ssp. *chrysotricha* from Albany, West Australia, than to specimens from the Mount Compass locality. Examples from the latter district and in particular those from Robe, South Australia, come very close indeed to the Victorian race, and I think will be hard to separate when we have specimens from intermediate localities along the Victorian shoreline.

Thanks to my friends F. M. Angel and N. B. Tindale I have been able to examine twelve males and three females taken near Port Lincoln.

Male. Forewing and hindwing above mummy-brown, forewing with a few basal hairs, yellow; cell spot 1·25 mm. square, a smaller spot in disc of area 3 and a trace of a spot below it in 2, maize-yellow (Ridgway 4); three minute subapical spots, white; a narrow black sex band from before vein 1 to vein 4. Hindwing, as forewing, a basal suffusion of yellow hairs, a central rectangular patch, 2·5 mm. long, 1·5 mm. wide, cadmium yellow (Ridgway 3). Cilia fore and hindwing, pale ochraceous-salmon (Ridgway 15).

Beneath; apex of forewing and the hindwing Saccardo's umber (Ridgway 29), lightening in tone towards the apex of the forewing. Hindwing with brown ringed cell and discal spots, that in area 1*a*, half the size of those in 2, 3, 6 and cell, all silver centred; those in areas 4 and 5 only faintly centred with silver.

Forewing length 15 mm.

Female. Forewing and hindwing above as in male, the three subapical spots larger and of equal size; an additional spot in area 2, of the same size as that in 3, and a small spot in the lower half of 1*a*, maize-yellow.

Beneath; apex of forewing and the hindwing as in male, though as in other races tending to be a tone lighter in colour. Cell and discal spots as in male, that in area 1 of hindwing one-third the size of those in 2, 3, 6 and the cell, all silver centred; in area 4 a brown dot, in 5 a brown elongate spot. Cilia as above.

Forewing length 16·5 mm.

Holotype male and allotype female labelled 'Wanilla Fount, Pt. Loncoln dist. 16 Oct. 1948 N. B. Tindale', in the collection of the South Australian Museum, with male and female paratypes in the S.A. Museum, the F. M. Angel and in my own collection.

Several males and one female were taken by F. M. Angel and N. B. Tindale flying on the morning of October 16th, 1948, and pupae were found in shelters on *Gahnia trifida* Lab., from which a number of males, but only two more females emerged on 19th and 22nd October. The shelters were of the usual *chrysotricha* type, similar to those from Mount Compass, Hobart, and from South Bruny.

Wanilla Fount, or Fountain, about twelve miles west of Port Lincoln, is a permanent freshwater spring discharging from the Uley Basin, flowing down to

the sea, distant some three miles at Kellidie Bay. The fountain is no more than 25 feet above sea level, and is surrounded by a luxuriant growth of *Gahnia trifida*, which becomes less vigorous away from the spring itself.

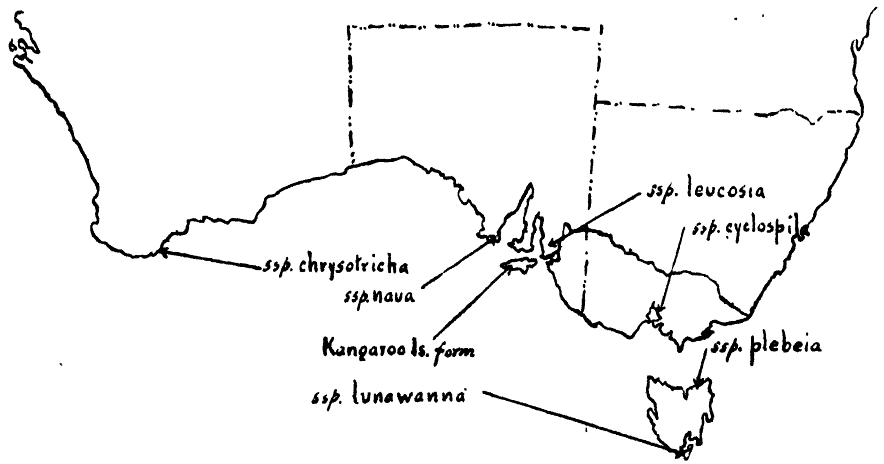
The area south and west of Port Lincoln where the butterfly is found was known as Nauo or Naua, the name of the aboriginal tribe formerly living there. The name of the subspecies from Port Lincoln perpetuates the name of this native tribe.

Thanks to F. M. Angel I have been able to examine a male and female of a possible additional race from Rocky River, Kangaroo Island. This locality is in the western part of the island, an area with a much higher rainfall. The pair, unfortunately not in the best condition, are noticeably darker than specimens from Mt. Compass, in this respect they are close to ssp. *naua* from Port Lincoln, especially on the underside of the hindwing. The discal silver centred spots on the hindwing beneath are small, as in typical *c. chrysotricha*, and particularly in the male they are very faintly tinged with silver.

The close resemblance between these western Kangaroo Island specimens and *c. chrysotricha* from Albany points to an association which is reminiscent of the strong relationship between the plants from Kangaroo Island and those from south-western West Australia (noted by J. G. Wood, 1930, Trans. Proc. Roy. Soc. South Australia 54: 105-139), a relationship which does not extend to the mainland areas of South Australia.

Specimens from Robe, South Australia, are as noted by Waterhouse (1938) intermediate between those from Mt. Compass and Melbourne, in fact the male and female kindly lent me by F. M. Angel, labelled 'Robe 6-11-37', are almost indistinguishable from a Frankston pair in my possession.

The accompanying map indicates the areas from which *Hesperilla chrysotricha* and its races have been described.



The following table sets out the distinguishing characters of the races of *chrysotricha*.

Male. Above.	ssp. *chrysotricha*	ssp. *naua*	ssp. *leucosia*	ssp. *cyclospila*	ssp. *plebeia*	ssp. *lunawanna*
Hindwing central patch.	2·5 mm. long 2 mm. wide	2·5 mm. long 1·5 mm. wide In appearance a distinct rectangle.	3 mm. long 1·5 mm. wide Frequently extended as a suffusion towards inner margin.	3·5 mm. long 1·5 mm. wide Frequently extended as a suffusion towards inner margin.	4 mm. long 1·5 mm. wide Usually extended towards inner and outer margin.	4 mm. long 1·5 mm. wide Usually extended towards inner and outer margin.
Male. Beneath. Apex of forewing and the hindwing.	'Reddish' (v. Meyrick and Lower)	Saccardo's umber (Ridgway 29)	Tawny-olive (Ridgway 29)	Buffy-brown (Ridgway 40)	Sayal-brown (Ridgway 29)	Snuff-brown (Ridgway 29)
Hindwing markings. Discal and cell spots.	Spot in 1*a* is half the size of 2, 3, 6 and cell spots, all silver centred.	Spot in 1*a* is half the size of 2, 3, 6 and cell spots, which are 1 mm. square, all clearly silver centred. Spots in 4 and 5 the size of that in 1*a*, but only faintly silver centred.	Spot in 1*a* is one-third the size of 2, 3 and 6 which are slightly elongated 1·5 mm. diameter, silver centred. Cell spot 1 mm. square, silver centred. In 4 a minute brown dot. in 5 an elongate brown ring.	Spot in 1*a* one-third the size of 2, 3 and 6, which are elongate, 2 mm. x 1 mm. all silver centred. In 4 and 5 brown rings. Cell spot 1 mm. diameter, silver centred.	Spots in 1*a* and 4 brown dots, in 2 and 3 faintly silver centred, in 6, 1 mm. diameter, clearly silver centred. In 5 a brown ring, in cell a brown ring.	Spots in 1*a* and 4 absent or just discernible as faint brown dots. Brown rings in 2 and 3, in 5 a brown dot. Spot in 6 is 1 mm. diameter, silver centred. Cell spot half the size of 6, silver centred.
Female. Above Forewing.			Usually a minute discal dot in upper half of 1*a*.	Usually a small discal dot in upper half of 1*a*.	Usually a minute discal dot in upper half of 1*a*.	
Beneath. Hindwing markings. Discal and cell spots.		Spot in 1*a* is one-third the size of 2, 3, 6 and cell spots which are 1 mm. diameter, silver centred. In 4 a brown dot, in 5 a brown elongate ring.	Spot in 1*a* is half the size of 2 and 3, which are narrowly elongate (2 mm. long), clearly silver centred. In area 6 a rectangular spot (2 mm. x 1 mm.), in cell the spot 1 mm. diameter, both clearly silver centred In area 7 a spot of the size of 2 and 3, but only faintly silver centred.	Spot in 1*a* is half the size of 2 and 3, which are elongate (2 mm. x 1 mm.), all silver-white centred. In 4 a brown ring, in 5 an elongate brown ring. Spot in 6 elongate (2·5 mm. x 1·5 mm), silver-white centred Cell spot 1·5 mm. diameter silver-white centred. In area 7 a spot of the size of 2 and 3. clearly silver-white centred.	Spot in 1*a* half the size of 2, 3 and cell spots, which are 1 mm. diameter, those in 2 and 3 slightly elongate, all silver centred. In 4 a minute brown dot, in 5 an elongate brown spot. Spot in 6 is rectangular (1·5 mm. x 1 mm.), silver centred, in 7 as those in 2 and 3, but only faintly silver centred.	A minute brown dot in 1*a*, in 2 a small brown ring, faintly silver centred. Spot in 3 is 1 mm. diameter, silver centred. In 5 a brown dot, in 6 the spot is 1·5 mm. diameter, slightly elongate, silver centred. Cell spot similar to that in area 3, silver centred.

The resemblance between the races found at Albany, Port Lincoln, western Kangaroo Island and South Bruny Island is remarkable, and is difficult to interpret when the isolation and the great distances between these races is considered. All of these races are noticeably darker in colour, especially the ground colour of the hindwing beneath, and the discal silver spots particularly in the males are very restricted and faintly marked.

It is to be noted that with the exception of *c. naua* from Port Lincoln, the other races, *c. chrysotricha* from Albany, the western Kangaroo Island form and the isolated *c. lunawanna* from South Bruny all inhabit areas of comparable rainfall, e.g., Albany 30-40 inches, western Kangaroo Island 'more than 25 inches' (v. Wood, 1930), and Lunawanna 34-38 inches per annum. Port Lincoln comes directly under the 20 inches isohyet.

Gahnia trifida Lab. is known to be the foodplant at Lunawanna and Port Lincoln, since although Wood (1930) omits it from his local list, recording *Cladium filum* only, it is certainly found at Wanilla Fountain, some twelve miles from Port Lincoln. Both plants are given by Wood as from western Kangaroo Island, and *G. trifida* is recorded from West Australia, so that it may be the choice of the butterfly in that locality also.

The races from Mount Compass, *c. leucosia*; the Port Philip area, *c. cyclospila*; and northern, eastern and south-eastern Tasmania, *c. plebeia* are very close to each other, they form a compact group not easy to separate. In general they are larger and lighter in colour, particularly on the underside of the hindwing, and especially in the female the silver spots of the hindwing beneath are notably increased in size and number.

The rainfall throughout this range, 25 inches at Mt. Compass, 23 inches at Hobart, 20 inches at Swansea is smaller than in the areas inhabited by the darker, outlying races, and at least in Tasmania the larvae feed on either *G. trifida* or *G. filum*.

The Mt. Compass locality is noteworthy. Distant some 10 miles from the shores of St. Vincent Gulf, it is a plateau c. 1000 feet in altitude, with low hills running several hundred feet higher. The highest locality at which *c. leucosia* has been collected is the small hanging swamps on Mt. Moon at c. 1200 feet. The habitat of this race differs completely from that of the other races of *chrysotricha*, elsewhere this species is usually found in small areas on or quite close to the sea and river shoreline.

Summary

The acquisition by the Tasmanian Museum of specimens of *Hesperilla chrysotricha* Meyrick and Lower, 1902, from near Hobart led me to undertake further investigations into the distribution and variation of this butterfly, with the result that an additional race, *c. lunawanna* is described from Tasmania, together with the true female of *c. plebeia* Waterhouse, 1927.

Lower considered the specimens from Port Lincoln, S.A., to be a distinct sub-species, we are now able to confirm this as we have caught and bred material in some quantity, and the name *naua* is now given to this sub-species.

The early stages, the foodplant and the distribution of the Tasmanian and South Australian races are described and discussed.

ACKNOWLEDGMENTS

I wish to thank the Director of the South Australian Museum for allowing me to examine South Australian Museum material, F. M. Angel and N. B. Tindale for specimens from Port Lincoln and other South Australian localities, the Director of the Tasmanian Museum and S. Angel for material from Tasmanian localities.

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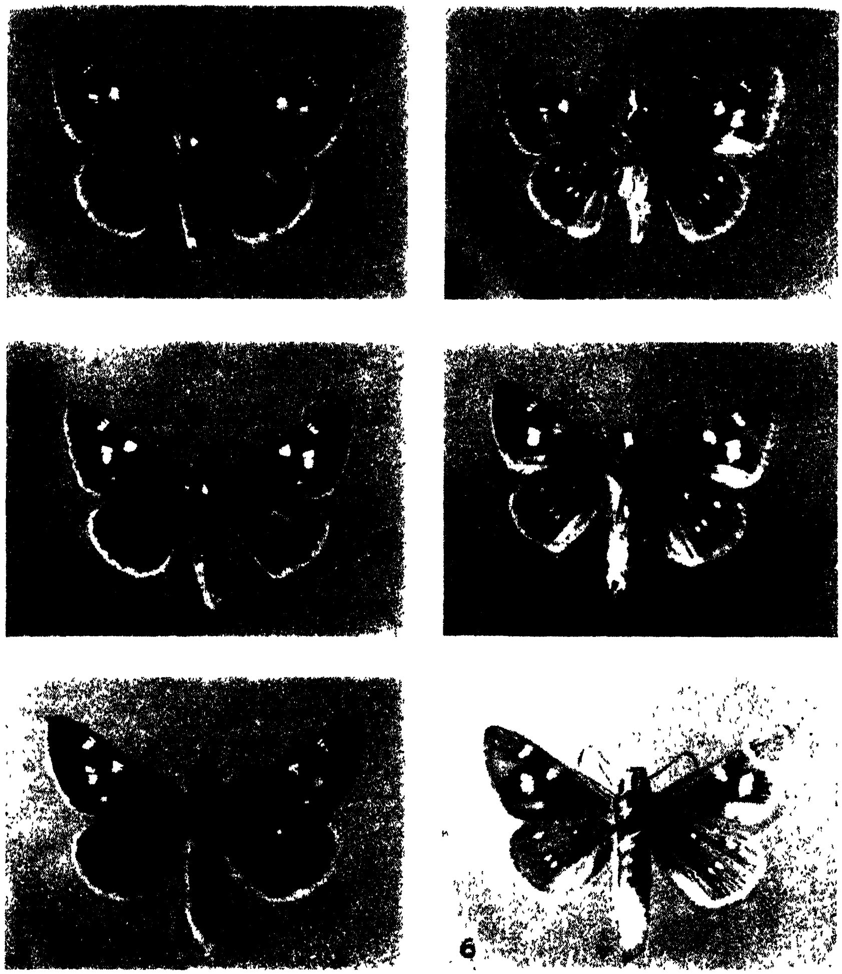
PLATE I

FIG. 1.—*Hesperilla chrysotricha naua* n.ssp. Holotype male, upperside. Wanilla Fount., Pt. Lincoln Dist., 16th October, 1948. x 1¼.
FIG. 2.—Male, underside of same specimen. x 1¼.
FIG. 3.—Allotype female, upperside. Wanilla Fount., Pt. Lincoln Dist., 16th October, 1948. x 1¼.
FIG. 4.—Female, underside of same specimen. x 1⅛.
FIG. 5.—*Hesperilla chrysotricha plebeia* Waterhouse. Female, upperside. Hobart, Tas., 7th February, 1948. x 1¼.
FIG. 6.—Female, underside of same specimen. x 1¼.


6

Neonatal Length as a Linear Function of Adult Length in Cetacea

By

E. O. G. SCOTT

(Read 2nd November, 1948)

FIGS 1-3

In the course of a study of body-form in the False Killer Whale, *Pseudorca crassidens* (Owen, 1846), it appeared expedient to attempt to estimate the length of the neonatus by the indirect method of comparison with the neonatal-adult ratio of length in other Cetacea. A cursory survey of the literature shows the length of the newly born young is said to vary in different species from about twenty to about fifty per cent of that of the adult animal. Among the Mystacoceti, at any rate in the case of the larger, commercially more important species, the mean lengths of calf and adult are known with a fair measure of precision; and it is usually stated (*e.g.*, Pearson, 1936) that in this suborder length at birth is 25-30 per cent of the maximum length. Among a number of the Odontoceti, our knowledge of which in this respect is less extensive and less reliable, these percentages are known at times to be considerably exceeded. There does not appear to be, however, at least in literature available to the writer, any account of a systematic attempt to seek a generalised expression of a possible correlation between the two magnitudes in a group of species. Investigations made in connexion with the special problem noted above soon disclosed the probable existence, among a small series of delphinids, of a significant linear regression of natal length upon adult length; and further consideration has led to the interesting suggestion that the relation may well have a broad (quite possibly an order-wide) applicability.

The purposes of the present paper are, first, to determine, on the basis of what appear to be the best available data for ten species of whales, the regression equation of length of neonatus on length of adult, and, secondly, to examine some of the biological implications of the relationship so formulated. Species dealt with are the Common Porpoise, *Phocaena phocaena* Linné, 1758; Common Dolphin, *Delphinus delphis* (Linné, 1758); White-beaked Dolphin, *Lagenorhynchus albirostris* (Gray, 1846); Bottle-nosed Dolphin, *Tursiops truncatus* (Montagu, 1815); Sperm Whale, *Physeter catodon* Linné, 1758; Humpback Whale, *Megaptera nodosa* (Bonnaterre, 1789); Piked Whale or Lesser Rorqual, *Balaenoptera acutorostrata* Lacépède, 1804; Sei Whale or Rudolphi's Rorqual, *Balaenoptera borealis* (Lesson, 1828); Fin Whale or Common Rorqual, *Balaenoptera physalus* (Linné, 1758); Blue Whale or Sibbald's Rorqual, *Balaenoptera musculus* (Linné, 1758).

1. Equation of Regression of Neonatal Length, ${}_pL_t$, on Adult Length, ${}_aL_t$

(a) Sources of Data. An eclectic survey of accessible information on length at birth, ${}_pL_t$, and adult length, ${}_aL_t$, in the ten selected species yields the entries in the first two numerical columns of Table I. For the first four species listed the values adopted are those given by conjectural growth curves (unpublished), arrived at by an analysis of the valuable records of British strandings by Harmer (1927): estimates for the remaining six species are based chiefly on dimensions recorded by Matthews (1937, 1938*a*, 1938*b*), Laurie (1937), Pearson (1936), Wheeler (1930, 1934), Mackintosh and Wheeler (1929), Harmer (1927, 1929), Lillie (1915), Beddard (1900), Gray (1866).

(b) Regression Equation. On being graphed the ten variates fall approximately along a straight line (Fig. 1); for which, with dimensions in centimetres, the best fit is

$$ {}_pL_t = 0{\cdot}2441 \; {}_aL_t + 44{\cdot}3 \qquad (1) $$

Values of natal length computed from this equation are entered in the third numerical column of the table. It will be seen the fit is very close, divergences ranging from 0·3 to 20·0 (mean 8·8) cm., or from 0·2 to 8·9 (mean 3·2) per cent. A test of the significance of the regression coefficient gives $t = 55{\cdot}13$: the correlation coefficient is $r = +\,0{\cdot}999$, or $z = +\,3{\cdot}60$.

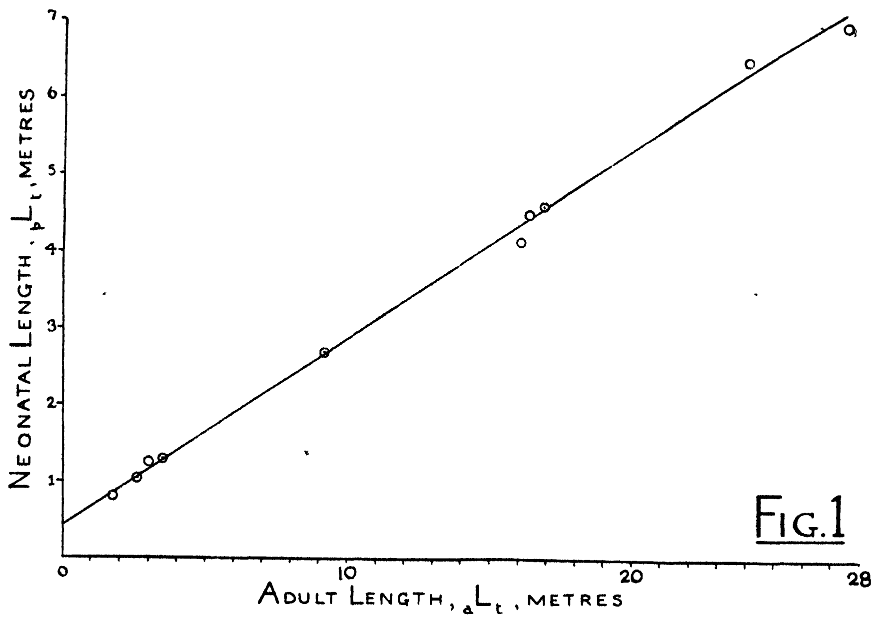


FIG. 1.—Regression of neonatal length on adult length in ten species of whales.

(c) Degree of Reliability, and Statistical Nature, of Equation. In the present imperfect state of our knowledge, the selection of the data for analysis necessarily involves a subjective element; and the high value of t obtained would seem to suggest the danger of bias towards the choice of estimates of a 'favourable' size may perhaps not have been wholly avoided. Even with all necessary allowances

made, however, there can be little doubt there subsists, at least among the species examined, a good measure of correlation: further, it seems highly probable the constants of the function as determined are of the right order of magnitude.

An indication of the extent of the swinging effect exerted by the maximum variate, whose extreme position lends it much weight, is afforded by the fact that, with adult length for the Blue Whale set at 2700 (all other variates remaining unchanged), the equation of the best straight line becomes

$$L_{pt} = 0{\cdot}2467\ L_{at} + 42{\cdot}3 \qquad (2)$$

With this equation the discrepancies between assigned and calculated values of natal length are 1·3-22·1, mean 7·5, cm., or 0·7-6·9, mean 2·8, per cent; $t = 85{\cdot}36$.

With adult Blue Whale length at 2600 (which seems low), but other variates unchanged, the equation becomes

$$L_{pt} = 0{\cdot}2512\ L_{at} + 39{\cdot}9 \qquad (3)$$

Discrepancies here are 0·2-26·9, mean 6·0, cm., or 0·1-7·8, mean 2·3, per cent.

For purposes of discussion equation (1) is throughout accepted as definitive.

The relationship as formulated in the regression has, of course, purely a statistical validity. Notable differences in adult size between male and female are familiar in many species: to what extent, if any, sexual size-differences characterise neonatal animals is uncertain (the onset of linear differentiation is set between weaning and sexual maturity in Blue and Fin Whales by Mackintosh and Wheeler (1929), and in the Humpback Whale and the Sei Whale by Matthews (1937, 1938*b*); and at sexual maturity in the Sperm Whale by Matthews (1938*a*): there is, however, some evidence to suggest that some at least of these estimates, which involve a period of from 8 to 15 months after birth, postdate the event). The convention has here been followed of taking as the definitive adult length an estimate of the maximum length generally (not uniquely, or exceptionally) attained, regardless of sex (males are characteristically larger in toothed, females in whalebone, whales). As an indication of the known or estimated extent of individual variation in foetal or young animals, four sets of data may be cited: *(i)* for 3, 2, 2, sets of twin foetuses of Humpback, Sperm, Sei Whales, respectively, included in the British Museum statistics quoted by Matthews, the coefficient of variability, V, is 2·89, 2·81, 39·88; 3·50, 13·29; 0·00, 0·00: *(ii)* records exist for most species of foetal lengths in excess of calf lengths, an extreme case occurring in the Common Porpoise (modal neonatal length *c.* 800 mm.; calves of 711, 500 mm. known): *(iii)* the specimens that appear to constitute the youngest year-class (estimated age 0-4 months) of Harmer's material of the Common Porpoise have $V = 5{\cdot}79$: *(iv)* the extensive *Discovery* data on Blue and Fin Whales, as here interpreted, give for animals of an estimated age of 4-17 months: Blue Whale, male (33 specimens), $V = 5{\cdot}45$, female (38), $V = 6{\cdot}75$, sexes pooled, $V = 6{\cdot}12$; Fin Whale, male (83), $V = 7{\cdot}48$, female (61), $V = 6{\cdot}63$, sexes pooled, $V = 7{\cdot}10$. Examples of estimates of variability in conjectural year-classes in older animals are: Common Porpoise, Common Dolphin, Bottle-nosed Dolphin, oldest (unsexed) year-classes (other than those consisting of a single individual), according to the present interpretation of Harmer's records, $V = 2{\cdot}45$, 3·07, 1·36, respectively; Pilot Whale, assumed age about 5 years, male (6 specimens), $V = 2{\cdot}75$, female (5), $V = 3{\cdot}72$ (Scott, 1942).

It is not improbable that in a given species the length of the calf is, statistically, a function of the length of the individual mother—*i.e.*, the present regression probably possesses (as is known to be the case with certain size-relationships in other forms) an intraspecific, as well as an interspecific, validity.

A point of some interest is the manner in which the regression cuts so decisively across taxonomic boundaries, even that of subordinal rank. Work by Thompson (1942) and by the authors whose researches he reviews has shown, indeed, that, in various groups of animals, quite a number of characters generally considered to represent qualitative and 'inherent' specific or generic differences, and hence, at least by tacit assumption, to be the visible manifestations of phylogenetic diversity, are actually simple functions of absolute magnitude. Morphological specificity is thus seen, in these cases, to reside, less in the individual specificity of the members of a constellation of form-genes, than in a single size-gene or an integrated polygenic magnitude-system. Preliminary investigations suggest that, among whales, such standard taxonomic characters as length of flipper and length to dorsal fin are, to a first approximation at least (due allowance being made for occasional wide divergences apparently interpretable as instances of marked specialisation) simple functions of length of animal.

(d) Minimum Length of Calf and of Adult. It will be observed that the relationship, as formulated, states that, as a limiting case, an adult length of 0 cm. is associated with a calf length of 44·3 cm., or a calf length of 0 cm. is associated with an adult length of —182 cm.; or, again, that for an adult length of 59 cm., or less, the length of the calf exceeds the length of the adult—propositions that are clearly biological fictions. The general paradox that thus arises is pragmatically disposed of by the denial of biological validity to the relation outside those limits of size that are actually encountered in nature: the matter is, however, worthy of being a subject of inquiry, and some aspects of it are discussed in the second section of the paper. At the moment, we need concern ourselves only with the lower limit of actual size. The biological zero on the abscissa is then represented, not by the mathematical zero, but by the minimum adult length that occurs (or, perhaps, could occur) among the Cetacea. Lesson (1826) speaks of a dolphin about 2 feet long, his *Delphinus minimus*, one of the species that 'have been named and figured by the sight caught of them when swimming!'[1] Present-day opinion puts the minimum length in the neighbourhood of 4-5 feet, or, say, 120-150 cm. Such an adult minimum would be associated, according to equation (1), with an initial minimum of 74-81 cm.: that neonatal whales of lesser length than this do, however, occur, even if only as occasional specimens of exceptionally small size, is shown by the record of Van Deinse (*cf.* Harmer, 1919), already cited, of an example of *Phocaena phocaena* Linné only 50 cm. long.

In the right-hand column of Table I the predicted length of the newly born calf is shown as a percentage of the assumed adult length: for the species considered (and the range in size is virtually that of the whole order) it varies from 26·0 to 49·7. Hence natal length ranges from about one-quarter to about one-half of full adult length; and as sexual maturity commonly considerably antedates full physical maturity, it may be expected that, in some of the smaller forms, the neonatal animal may at times be more than half as long as its parent. Among the shorter species the ratio of initial to final length will increase rapidly in value with decreasing size of parent: with adult length, in cm., of 180, 160, 140, 120, for instance, the percentage length of calf, as given by the formula, is 49, 52, 56, 61, respectively.

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(1) The remark of Gray (1866, p. 267) here quoted, together with his exclamation mark, provides, incidentally, an oblique comment on the history of a species, *Lagenorhynchus wilsoni* Lillie, named as recently as 1915: *cf.* Lillie (1915, p. 123), Wilson (1907, p. 9, fig. 7).

2. Some Possible Biological Implications of Equation (1)

(a) General Observations. In the last section it has been noted that the relationship between neonatal length and adult length formulated in equation (1) involves, as a limiting case, an association of a calf length of 44·3 cm. with an adult length of 0 cm., or an association of an adult length of −182 cm. with a calf length of 0 cm., or, again, at an adult length of 59 cm., and below, an excess of natal over adult length. In cases of this kind it is conventional to observe that a formal extrapolation beyond the 'domain of definition', that is to say, beyond, in the present instance, the limiting values of the relevant variables as biologically valid and objective magnitudes, must result, not unnaturally, in quantitative statements that are, by biological criteria, meaningless, anomalous, or erroneous; and to let the matter rest there. It may not prove wholly unprofitable, however, to step for a few moments into, or at least to stand at the frontier of, the realm of free speculation, and to inquire briefly into the possible significance of the constants of the equation. While the relevant mathematical specifications and corollaries are, indeed, evident on inspection, certain biological implications that may tend to be overlooked will repay investigation. Our formal analysis leads us, we find, in the event, first, into the field Haecker (1925) has termed phenogenetics, the study of ontogenesis to determine the stage of development at which the difference between types first becomes manifest; secondly, to aetiology in the Thompsonian sense of a sub-science of the causes operative in both ontogeny and phylogeny; thirdly, at least by implication, to the borders of a region, apparently as yet unnamed, that may be descriptively termed 'extra-somatic morphology'.

(b) Composite Lengths: Mathematical and Conceptual Bracketing. With, as before, L signifying length, the presuffixes a and p denoting adult and prenatal, and the postsuffix t meaning total, we rewrite equation (1) with two significant figures

$$ {}_{p}L_{t} = 0{\cdot}24\ {}_{a}L_{t} + 44 \tag{4}$$

Let 0·24 (gradient of the regression line) $= m$; let 44 (intercept on the x-axis) $= c$; let 182 (intercept on the y-axis) $= d$ (Fig. 2A). Then

$$ {}_{p}L_{t} = m\ {}_{a}L_{t} + c \tag{5}$$

and, rearranging terms,

$$ {}_{p}L_{t} - c = m\ {}_{a}L_{t} \tag{6}$$

and

$$ {}_{p}L_{t} = m\ ({}_{a}L_{t} + d) \tag{7}$$

Since the quantities are finite, and the appropriate conventions are observed, this routine algebraic manipulation is, in itself, unobjectionable. Let us now, however, take an additional step, and assume, for the moment, the legitimacy of bracketing, not only the numerical values, but also the biological concepts with which the dimensions may be associated. Thus, the dimension length of calf at birth, ${}_{p}L_{t}$, can be divided into the two components c and $({}_{p}L_{t} - c)$: it is postulated that the concept of length of calf at birth is susceptible of being regarded, for biological purposes, as a composite concept, divisible into two elements, first, a concept of some recognisable kind of calf length (as yet biologically unspecified) legitimately associated with the length-component c, and, secondly, a comparable concept, the correlate of the length-component $({}_{p}L_{t} - c)$. Similarly, the sum of ${}_{a}L_{t}$, the ordinary adult length, and d, the abscissal intercept, is treated, both numerically and conceptually, as a composite length.

It is desirable to have some sematic convention for indicating in which of two senses a reference to a dimension is to be taken. In the notation adopted the symbol of a dimension considered *per se* includes a literal postsubscript written without a dash: to the postsubscript letter of a dimension that is to be thought of in the context primarily as a composite length, or as a component of a composite length, a dash is added. A dashed postsubscript will often point to a concept, an undashed usually to a numerical value. The several lengths, original and composite, with their subdivisions and components are defined ostentively in Fig. 2. In view, however, of the lack of parallelism in structure between adult and neonatal composite lengths, it may perhaps be expedient to set out the specifications formally, as in the next paragraph.

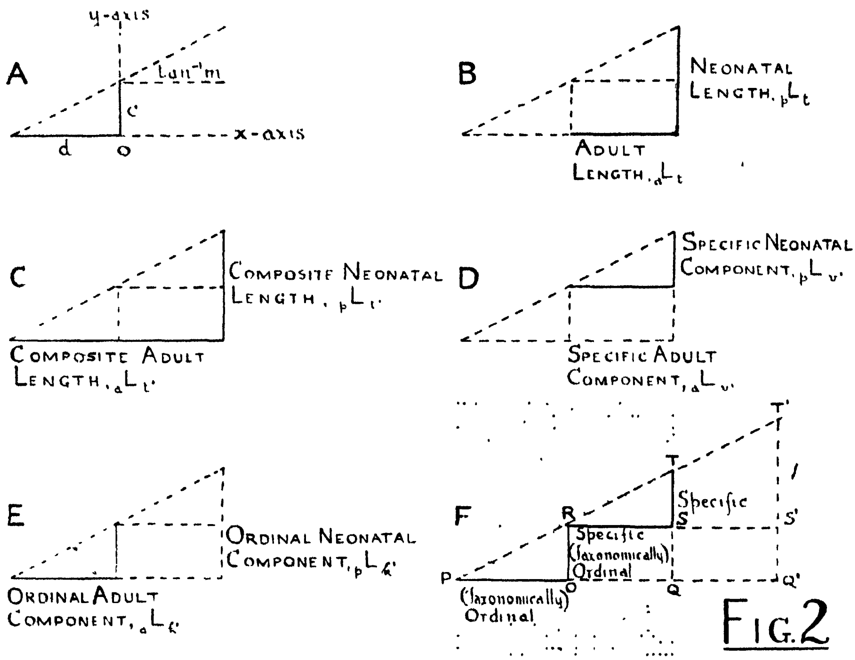

FIG. 2.—A: The constants of the regression equation.

B-E: Ostentive definitions of ordinary lengths, composite lengths, components of composite lengths. The magnitudes defined are shown as continuous lines, set in a reference framework of dashed lines.

F: Relation between specific and (taxonomically) ordinal components of composite calf and adult lengths. The extra-(calf-adult) universe is shaded.

The vertical scale is throughout twice the horizontal scale.

To the existing notation add: postsuffixes v, a variable quantity, and k, a constant quantity, such that $v + k = t$ (total). Further add that when a dimension-symbol including t is to be read as a composite length, t becomes t^1: when v and k are to be regarded as components of a composite length, they become v^1 and k^1, being then termed (for reasons noticed below) specific and (taxonomically) ordinal components, respectively. Then we have:

(*i*) Ordinary Lengths (Fig. 2B)

Neonatal length $= {}_{p}L_{t}$. Adult length $= {}_{a}L_{t}$

(ii) Composite Lengths (Fig. 2C)

Composite neonatal length $= L_{pt^1} = L_{pv^1} + L_{pk^1} = L_{pt}$

Composite adult length $= L_{at^1} = L_{av^1} + L_{ak^1} = L_{at} + d$

(iii) Variable (Specific) Components of Composite Length (Fig. 2D)

Specific neonatal component $= L_{pv^1} = L_{pt^1} - L_{pk^1} = L_{pt} - c$

Specific adult component $= L_{av^1} = L_{at^1} - L_{ak^1} = L_{at^1} - d = L_{at}$

(iv) Constant (Taxonomically Ordinal) Components of Composite Length (Fig. 2E)

(Taxonomically) Ordinal neonatal component $= L_{pk^1} = L_{pt^1} - L_{pv^1} = c$

(Taxonomically) Ordinal adult component $= L_{ak^1} = L_{at^1} - L_{av^1} = d$

Equation (6) can now be rewritten in the form

$$L_{pv^1} = m\, L_{av^1} \quad (8),$$

that is, the specific neonatal component is directly proportional to the adult specific component. Equation (7) can be written

$$L_{pt^1} = m\, L_{at^1} \quad (9),$$

that is, composite neonatal length is directly proportional to composite adult length. These two relationships are evident at sight from Figs 2C, 2D.

Both L_{pt} and L_{at} are, of course, theoretically divisible into an indefinite number of systems of components: the justification for the division here of each dimension into two components, and, further, into the particular two components selected, is simply the pragmatic one that the algebraic, or geometrical, situation suggests this as an obvious procedure. The question of whether there is equivalence, or adequate formal correspondence, between the operations and products of algebraic bracketing and those of conceptual bracketing is one of some difficulty: we assume the validity of the procedure provisionally with a view to ascertaining where we are thereby led.

It will be convenient to divide the rest of the inquiry into three sections, the first dealing with the possible biological significance of the concept of composite calf length, the second with possible biological significances of the concept of composite adult length, and the third with a possible interpretation involving a comparison of composite calf and adult lengths below the morphologically valid minima.

A. Biological Interpretation of Composite Calf Length

(a) Ordinal and Specific Components. The problem is to find a more or less evident and 'real' biological meaning for composite calf length, L_{pt^1}, the sum of the fission products of the measured length at birth of any species, L_{pt}, in the shape of a component, L_{pk^1}, of fixed magnitude, and a component, L_{pv^1}, intraspecifically of (statistically) constant, but interspecifically of variable, magnitude. Now, it is not difficult to conceive of the possible existence of a biologically necessary, or optimal, minimum foetal magnitude of an interspecific validity, a lowest common measure, as it were, of cetaceanesse. The composite concept of composite calf length could thus be the sum of a concept of a constant dimension of specifiable embryonicity and a concept of a variable dimension of specifiable embryonicity.

It would seem natural next to equate the two concepts to the two numerical components of calf length, constant to constant and variable to variable. The ordinary measured length of the neonatus is then seen as the simple arithmetic sum of the linear dimensions of a phase of intra-uterine development, the length of which (44 cm.) is an interspecific constant, and a phase the length of which is directly proportional to (being 0·24 of) the adult length of the relevant species. The constant $L_{p\ k^1}$ it is proposed to call the (taxonomically) ordinal component, the variable $L_{p\ v^1}$ the specific component, of composite calf length, $L_{a\ t^1}$. (Consideration of the context should always resolve any possible confusion between ordinal in the taxonomic sense and—what does, indeed, enter into the present discussion—ordinal in its geometrical sense.) It may here be noted, in passing, that the constant and variable fractions, $L_{a\ k^1}$ and $L_{a\ v^1}$, of composite adult length, $L_{a\ t^1}$, are likewise termed the ordinal component and the specific component, respectively.

Clearly, it is impossible to differentiate observationally in the neonatus itself between the ordinal and specific fractions of its length. And $L_{p\ v^1}$ and $L_{p\ k^1}$ remain biological abstractions unless we can interpret them in terms of morphological development; that is, unless we can regard them, for example, as—to select the simplest possibility—associated with, and representative of, two recognisably distinct embryological phases.

(b) Temporal Relations of Components. If two such phases do exist, a question that immediately presents itself is that of their temporal character, extent, and relation. Are they *(i)* continuous and strictly successive; *(ii)* continuous and partly successive (*i.e.*, with some overlap); *(iii)* continuous, contemporaneous, and of equal duration; *(iv)* continuous, contemporaneous, but of unequal duration; or *(v)* otherwise characterised and related (*e.g.*, exhibiting discontinuity, periodic or aperiodic, manifested wholly contemporaneously, or partly contemporaneously, or successively; and so on)?

(c) Components Continuous and Strictly Successive. If the relation is that of *(i)* above, a moment's consideration of the normal course of ontogeny as one of increasing differentiation leads to the selection of what has been designated the ordinal phase as much more likely to be the prior one. This is so even when the differentiation is regarded solely in its individual ontogenetic context: the likelihood of ordinal phase priority is enhanced when the embryo's history is regarded also as being an approximate correlate of phylogeny, at any rate to the extent of manifesting the same broad temporal sequence of aromorphs or other major landmarks. There is thus tentatively pictured, then, an intra-uterine history whose first epoch, from fertilisation to the achievement of a fixed length of round about 0·4 metre, results in the establishment of a degree of morphological differentiation (associated with an appropriate measure of overall embryonic integration) that is perhaps in some sense constant throughout the order, and whose second, immediately succeeding epoch, culminating at birth, involves an increment in length that varies with the species, but is in all forms equal to about a quarter of adult length. Evidently the constancy of degree of morphological development thus suggested as characterising the first epoch could be a constancy in respect of one or other of various criteria; of which two call for special notice.

Is such a definite morphological status to be interpreted in terms of interspecific or of intraspecific heredity: that is to say, are all cetacean foetuses of length *c* cm., of whatsoever species, indistinguishable from one another; or, alternatively, have all foetuses, no matter of what species, that have attained a length *c* cm. thereby

climbed to the same relative rung on their own specific ladders of morphogenesis? That whale foetuses of a length of the order of half a metre should exhibit no sign of specific differentiation would seem to be, on the face of it, a somewhat remote contingency. If a constant measure of bodily organisation is characteristically associated with the ordinal component, it is hence probably definable in terms of the traversing of some fixed fraction of the ontogenetic norm of the species. Since the length-increment $L_{p\,v^1}$ of the second epoch is directly proportional to specific length—equation (8)—a morphological end-point of the period of growth from zero length to a length c that at once suggests itself as probable is that of the acquisition of the characteristic features of the relevant species.

(d) Components Otherwise Related. Considerations such as those just outlined could be valid only if the nature and the position in time of the two presumed developmental epochs were those of *(i)* in par. *(b)*, above, namely, continuous and strictly successive. This will be accepted as the definitive specification of the two phases: accordingly, it will be necessary to do little more than glance at some of the other possibilities. If the situation were that of *(ii)*, the location and extent of the temporal overrun could be determined from a complete time-length graph of foetal growth if the rates of growth were constant, or subject to constant acceleration, but scarcely otherwise. If the situation were that of *(iii)* or *(iv)*, the phases would be unrecognisable by external, visually determinable criteria; but might conceivably be interpretable, more or less directly, in terms of some such element of growth as, for instance, the deposition of a certain amount of non-crescive framework. Situations of the types suggested by *(v)* would almost certainly be of too complex a nature to admit of analysis.

(e) Has the Hypothetical Two-Phase Pattern a Real Existence? It may now be inquired whether the hypothetical two-phase pattern that we have been led from an examination of equation (1) by a process of purely formal reasoning to postulate has any factual existence.[1]

Mackintosh and Wheeler (1929, p. 426) observe regarding the Blue Whale and the Fin Whale. 'It is a characteristic feature of the development of these whales that the form of the body is practically perfected at a stage when the foetus is still very small. A 0·5 m. foetus, for instance, differs very little in appearance and bodily proportions from the adult and so far as the internal structures are concerned the organs are probably all laid down by the time the foetus has reached 0·1 m.'. Matthews (1938*b*, p. 36) notes that pigmentation has begun in Sei foetuses of 0·64, 0·51, 0·4 m., and, again (1938*a*, p. 119), that in the Sperm Whale pigmentation starts before a length of 0·5 m. is reached. Harmer (1927, p. 24) states that Guldberg and Nansen (1894, p. 22), to whose paper I have not at present access, observe of the White-sided Dolphin, *Lagenorhynchus acutus* (Gray, 1828), that the generic characters are acquired when the foetus reaches one-fifth of its full length, which is given as about 950 mm., and the specific characters at about half that length.

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(1) In the paper as originally written there appeared, in place of the paragraph to which this footnote is attached, the following sentence. 'Whether or no' a succession of two phases 'of the nature and magnitude here envisaged actually occurs, is a question that should be readily enough determined by an appropriate investigation: the requisite data may, indeed, already be contained in the literature, but the writer is at present without means of access to likely sources of information'. The striking corroborative evidence in the cases of the Blue Whale and Fin Whale given by Mackintosh and Wheeler, and now quoted, was then not at hand.

It has been thought permissible, in the circumstances, to record here this act of philosophic faith.

(f) Similar General Conclusions Already Reached on Different Grounds. It is of interest to observe that the general conclusions here reached by an inquiry into the formal significance of an extrapolation of the equation of regression of neonatal on adult length beyond the strict calf-adult domain of definition have in large part already been arrived at (with particular reference to two species) by Mackintosh and Wheeler on quite different grounds. At the conclusion of a fairly detailed investigation of the sexual cycle and the growth of the calf in southern Blue and Fin Whales, they remark that the difference in size between the two species is apparent quite early in the development of the foetus. 'This specific difference in size is attained simply by more rapid growth on the part of the larger species and not by growth spread over a longer period. Blue whales are apparently ready for birth at a greater length in, if anything, an actually shorter time than Fin whales. It is probable that in the early stages of the development of the foetus, when the organs are being formed and the limbs completed, the actual increase in length would be approximately the same in both species, and it may be suggested that development up to this point does not differ in any special way from the development of other mammals, and that the foundations for the whale's great subsequent size have not yet been laid down. After this, however, instead of development being quietly finished off and birth taking place, the rest of gestation is devoted to a great burst of growth, the rapidity of which in the different species appears to be proportional to the size of the whale when fully adult. As it is practically certain that the great size of whales is, from the evolutionary point of view, a recently acquired character, it would naturally be expected to make its appearance in the later part of gestation. Thus the great size of a whale does not necessarily imply the need for a long period to attain that size. The capacity for rapid growth is to be regarded rather as one of a number of characters distinguishing certain whales from other mammals.'.

(g) Location in Time of the Ordinal-Specific Ontogenetic Crisis. Conjectural curves of foetal growth have been formulated in the *Discovery* Reports for five species: for the Blue Whale and Fin Whale by Mackintosh and Wheeler (1929)—Laurie (1937) reproduces these authors' curve for the Blue Whale, which he finds closely fits the additional data obtained by the *Southern Princess* and the *Southern Empress* in 1932-3—and for the Humpback, Sperm, and Sei Whales by Matthews (1937; 1938*a*, *b*). Direct readings from the graphs give the approximate age at which a length of 44 cm. is attained as 2·9, 3·0, 4·0, 4·5, 3·4 months, respectively; or about 28, 26, 37, 36, 36 per cent of the estimated period of gestation. (In an unpublished analysis, in which it is shown that three of the five *Discovery* curves are allometric, and, further, that the data for *Balaenoptera borealis* (Linné) and *Physeter catodon* Linné, the published curves for which species are combinations of an earlier curvilinear and a later linear segment, can, by suitable technique, also be fitted by a curve of the form $y = bx^{a}$, the equations found for foetal growth give an estimated mean age, in these five species, at a length of *c* cm., of 3·5 $\pm$ 0·27 months, equivalent to 27·7 $\pm$ 1·5 per cent of the gestation period, or, in the four balaenopterids, 3·3 $\pm$ 0·27 months, or 27·4 $\pm$ 1·9 per cent.)

A period of three-four months would seem, on the face of it, one of sufficient duration to permit of the achievement of the advanced stage of morphological differentiation that the present theory postulates: along another line of approach, there is the evidence of Mackintosh and Wheeler that at a length of the order of that here associated with the presumed ordinal-specific ontogenetic crisis foetuses of the Blue Whale and Fin Whale differ little, except in point of size, from the adult animal.

(h) Mean Ratios of Growth in Ordinal and Specific Phases. On the basis of the allometric curves of foetal growth noted above, and the definitive neonatal and adult lengths of Table I, the estimated mean rates of growth, in cm. per month, of Blue, Fin, Humpback, Sei, Sperm Whales during the ordinal phase are 15·1, 15·3, 10·9, 13·0, 10·6, respectively; while those during the specific phase are 89·5, 73·3, 44·3, 46·7, 30·4.

For the four balaenopterids the regression of mean specific phase growth rate on adult length is linear, with a significance of better than $P = 0{\cdot}01$: the inclusion of the physeterid reduces P to about 0·1. Thus while it is possible the mean rate of growth during the foetal phase given over primarily to increase in bulk is a linear function of adult length in all whales, there may, on the other hand, perhaps exist a series of (probably not greatly dissimilar) family, or other, norms.

In the ten species of whales, representative of three families, here considered it has been established that the actual increment in length of the foetus from a length of 44 cm. to birth, *i.e.*, in the course of the specific phase, is directly proportional to adult length. By the use of the concept of composite lengths this relation assumes the symmetrical and elegant form—equation (8)—of a constancy of ratio of specific components.

B. Biological Interpretation of Composite Adult Length

(a) Contrast between Neonatal and Adult Ordinal Components. Some tentative conclusions having been reached regarding the significance of composite calf length, attention may next be turned to the investigation of composite adult length. In its general sense (with an interspecific application) composite adult length is the sum of an ordinal component, $L_{a\,k^1}$, which is a length, d, of 182 cm., and a specific component, $L_{a\,v^1}$, equivalent to the actual measurable length in cm. of the relevant species. As is shown by equation (9), it is directly proportional to composite, and hence to ordinary, neonatal length.

A marked difference in nature characterises the ordinal fraction of calf length and the ordinal fraction of adult length. The former is a real quantity in the sense that, by hypothesis, it represents the measurable length—if only, in the limit, the instantaneous length—of a foetal organism In the neonatus it continues to make a contribution, numerically specifiable, to the total length of the animal; though, it is true, it no longer constitutes a similarly specifiable morphological fraction—extension, *per se*, is still there, but the matter whose linear distribution was formerly determined by measurement is now (in the form of itself or of metabolic replacement of equivalent mass), by protoplasmic intususception, redistributed, with loss of its original diagnostic spatial and anatomical quiddity. The latter, on the other hand, is unreal in the sense that it is, so far as can be seen, at all times a purely abstract magnitude, being in no known circumstances directly interpretable as so much 'length of solid whale', and even appearing, in an extrapolation in the neonatal-adult graph, as a negative dimension.

(b) Four Selected Aspects of Problem of Significance of $L_{a\,k^1}$. Of the various aspects of the general problem of the significance of the ordinal adult component that present themselves for inquiry, four only will be noticed here. These centre on the following suggestions: first, that the magnitude of $L_{a\,k^1}$ is determined by the factors of the mathematical situation already examined, and is hence without

recognisable or necessary biological significance; secondly, that $L_{a\,k^1}$ respresents a value more logically associated with a correlation surface than with a regression line; thirdly, that the observed regression of $L_{p\,t}$ on $L_{a\,t}$ involves an intelligible geometrical specification of adult form in terms of extra-somatic magnitudes; fourthly, that $L_{a\,k^1}$ and $L_{p\,k^1}$ represent phylogenetic norms of adult and foetal size. Some of the points raised present some novelty and difficulty; and it will be feasible to state. but scarcely to discuss, them.

(c) Ordinal Component as Mathematically Determined. The existence and magnitude of $L_{a\,k^1}$ are, in a purely mathematical sense, necessary consequences of the magnitude of the numerical coefficient of $L_{a\,t}$ and of the constant term c in equation (1): in graphical terms, d, the abscissal intercept of the extrapolated regression line, is determined jointly by m, the gradient, and c, the intercept on the y-axis. If, then, c and m are accepted as the values of two definitive biological quantities of whose relationship the regression equation is a complete specification d, or $L_{a\,k^1}$, may be a mere logical corollary of them and without any necessary, or recognisable, biological significance.

(d) Biological Situation Better Regarded as a Correlation than as a Regression. With the term correlation used, in a common sense, simply to denote a tendency for two variables to vary in magnitude *pari passu*, and the term regression in a strict sense of a measure of magnitude of mutual change in two quantities standing in a more or less obvious relation of cause and effect, the distinction between correlation and regression is clearly enough marked at the extremes. Borderline cases are, however, not infrequent in practice: and in such instances the regression technique is often adopted as a matter of expediency, with a view to the convenience of having the relationship so formulated as readily to yield estimates of individual variates. Needless to say, there is no difference of formal validity of the results of the two procedures, and the matter at issue is not a mathematical one: the point here to be made is that the mere employment of the regression method of approach may, in itself, be taken to derive from an implicit assumption of a recognisable causal relation between the two sets of variates, and such an assumption may, upon occasion, by estoppel of inquiry, lead to failure to recognise the existence of a less proximate principle. This may be the case here. Of the three quantities c, m, d, the first has, indeed, been provisionally interpreted as length at the close of an earlier, so-called ordinal phase, and the second is the ratio of the increment in length during a second, so-called specific phase to the total adult length; while the third so far remains uninterpreted. We have, however, at the moment, no adequate grounds for selecting m and c, or, indeed, any particular pair of factors, as the unique data of the general problem of significance that arises with extrapolation beyond the confines of the original calf-adult universe; nor, indeed, any logical warrant even for assuming all three to be other than principal and coördinate factors of an esemplastic vital situation in which such an element as, for instance, duration is of comparable significance with extension. It may therefore be suggested it is not unlikely that the two magnitudes for which modal descriptions have been found are, in effect, indices of biological optima themselves as yet unrecognised, though not improbably susceptible of formulation, on further investigation, in terms of measurable quantities (such as—to take instances involving length only, and neither time nor mass—area-volume relations, coelome-foetus size-ratio). In such circumstances the meaning of d is still open to search.

(e) Significance of Extra-Somatic Spatial Frameworks of Reference. Now, a biological length of an extra-somatic or, in one sense, 'imaginary' character, or including an extra-somatic or 'imaginary' segment, may well appear, on the face of it, a somewhat surprising datum. That the concept of a composite length, in the sense of a length made up of a segment, or segments, measured along an axis of the body of an animal and a segment extending freely into space beyond the physical boundaries of the animal can represent a simple and convenient specification of morphological pattern is well exemplified in an admirable study of the body-forms of fishes by Gregory (1928). In the fish figured in illustration of his terminology (Fig. 117A) the opisthion-pygidion interval is—and in most teleosts and elasmobranchs it will be—a composite length, comprising a somatic pygidion-uranion segment and an extra-somatic uranion-opisthion segment. Now, as Gregory points out (p. 337), the distance of the opisthion behind the pygidion is evidently (*cf.* his Fig. 118D) a function of his dorso-posterior angle, which is the upper half of the angle of the run. Here, then, the magnitude of a segment of the produced anteroposterior body-axis that—in those fishes with posturanic opisthion; and they constitute the modal group (Gregory, p. 349)—lies wholly in space outside the body becomes, by a simple geometrical transformation, a direct specification of body-form. Again, the following remarkable relation has been found, on analysis of data collected by the writer, to obtain in the False Killer Whale (there is reason to believe that, with some possible modification, it holds good in various other species also). Let a series of important anatomical landmarks be numbered in sequence of their occurrence, proceeding caudad along the main antero-posterior axis, from 2 to 9 (no landmark has yet been associated with 1). Then the logarithms of the lengths from the tip of the snout (prosthion) to the several points constitute a linear function of the logarithms of the relevant natural numbers. That is, if λ = length from tip of snout to given anatomical landmark; $n = 2, 3 \ldots . 9$, then

$$\lambda_n = A\, n^k \qquad (10)$$

The last term, $n = 9$, is the caudal notch, or the morphological end-point of the body. In a world perhaps not wholly devoid of grain of quinary idiosyncrasy it is not unnatural to inquire, what is $n = 10$, and where is it located? As to its location, it clearly lies somewhere on the produced main body-axis in postcaudal extra-somatic space: as to its nature, it has been found to be a point of intersection in a circum-somatic system of axes of reference such that if y is the distance, measured from it as origin, to any point on the anteroposterior axis caudad of the dorsal fin, and if x is the girth at the level of that point, $y = cx^k$.

While in the first of these examples the composite length is, from the point of view of morphological specification, an *à priori* geometrical construction, a subject for prognosis, in the second it is *à posteriori*, a subject for diagnosis, the observed situation (formulated, in this instance, empirically) being interpretable anatomically only by further inquiry (in this instance, the conclusion was reached by *ad hoc* methods). It is possible the position in regard to the present composite length $L_{a\,t^1}$, of which $L_{a\,k^1}$, or d, is the extra-corporeal segment, is analogous to that in the second example cited.

(f) Interpretation of $L_{a\,k^1}$ and $L_{p\,k^1}$ as Adult and Foetal Phylogenetic Norms. It is found—equation (8); Fig. 2D, Fig. 2F triangle RST—that the specific component of calf length $(L_{p\,t} - c)$ is directly proportional to the specific component

L_{at}, the former divided by the latter being tan m. Again, the taxonomically ordinal calf component divided by the taxonomically ordinal adult component d is tan m. Now, in Part A reasons have been advanced for regarding the prenatal specific-ordinal ratio $(L_{pt} - c)/c$ as the numerical counterpart of a genuine and significant specific-ordinal concept ratio, L_{pv^1}/L_{pk^1}, in the embryonic history. Does it follow, by symmetry, that the adult specific-ordinal ratio L_{at}/d is the numerical counterpart of a genuine specific-ordinal concept ratio, L_{av^1}/L_{ak^1}, in adult history?

Expressed geometrically, the argument is as follows. The triangles RTS, PRO, in Fig. 2F, are similar, and TS/RS = RO/PO (= tan m), and TS/RO = RS/PO: but TS/RO is, if our earlier conclusions are valid, the numerical correlate of the biologically interpretable prenatal ratio L_{pv^1}/L_{pk^1}: is it to be expected, by the logic of symmetry, that RS/PO is in similar manner the numerical correlate of a biologically interpretable adult ratio?

It will be realized, of course, that by interpreting the situation in a purely geometrical sense the original Cartesian formulation has been departed from, and attention is no longer paid to sign. In view of the fact that, taking OQ in Fig. 2E as the measured adult length of the smallest species, everything to the left of the line TQ lies outside the domain of definition of the original variables, it is not altogether surprising, but perhaps rather to be expected, that an anomaly in sign should be encountered. The calf length on adult length regression graph, extrapolated beyond its biologically valid minimal values, is now being asked to bear a heavy weight of extra-limital significance, and is being examined as a potential source of clues to the nature of an evolutionary situation, into which duration, not in itself inherent in the graph, enters as an essential element.

Since L_{pk^1}, our analysis leads us to conclude, represents a minimum length to which all foetuses, of whatsoever species, must attain before they begin to exist as species-differentiated foetuses, the logical parallel for L_{ak^1} would appear to be that of the minimum length to which all adults, of whatsoever species, must attain before they begin to exist as species-differentiated adults. But d is a negative quantity, and does not appear in the ordinary adult length as a measurable quantity. It would seem, accordingly, on this interpretation, to precede the ordinary adult length in time, and apparently to represent the length of a generalised, phylogenetic norm of cetacean adult esse, in short, an archetype. Its non-contemporaneity with the length of the individual specimen of whale would then be symbolically indicated both by its location outside the formal, observable domain of definition and by its negative sign. As specified by equation (1) its value is 182 cm.: the use of equations (2) and (3) give alternative values of 172, 159 cm. In a similar way L_{pk^1} could be interpreted as a phylogenetic foetus norm; its length being approximately one-fourth of the length of the phylogenetic adult norm. It should be observed that acceptance of this interpretation of L_{ak^1} does not of necessity invalidate the suggestions considered above under *(d)* and *(e)* of subsection B, since it represents an apparent justification of *(d)*, and may be an example of, or be exemplified by, *(e)*: again, the present meaning attached to L_{pk^1} is not antagonistic to, but is an extension or restatement of, conclusions reached in subsection A.

The formal parallelism that on development of the position here reached is seen to characterise the two original variables of calf length and adult length beyond the original domain of definition is briefly discussed in the next subsection.

C. Formal Correspondence of the Disarticulated Variables beyond the Calf-Adult Domain of Definition

The suggested interpretation of $L_{p\,k^1}$ and $L_{a\,k^1}$ as size-norms of integrated biological units leads, when further developed, to the recognition of a noteworthy correspondence between the original variables of calf length and adult length when these are disarticulated at the level of biologically minimum size, subjected to separate analysis, and then suitably equated. A detailed discussion of the problem lies beyond the scope of the present paper; but the following brief account, taken in conjunction with Figs 3A, 3B, will serve to make clear the more immediately relevant aspects of the general situation.

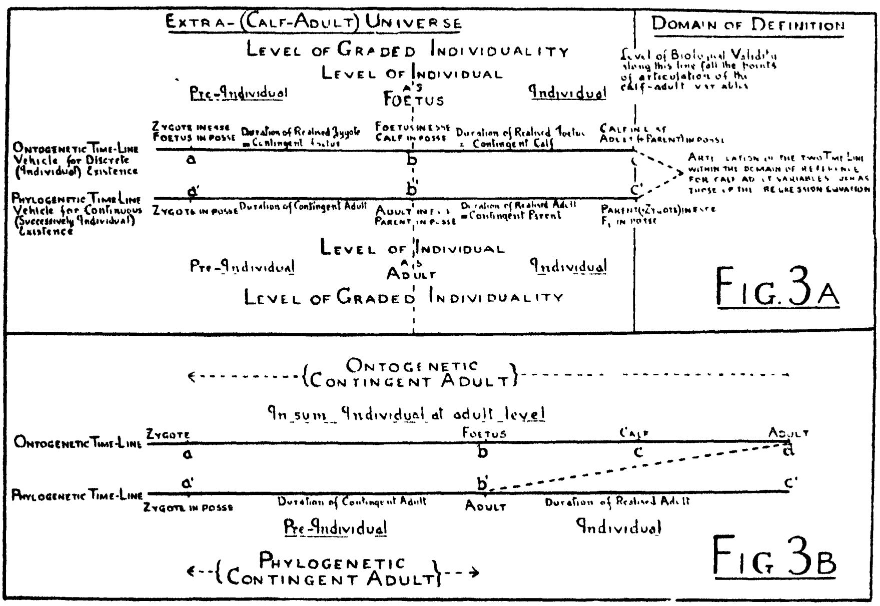

Fig. 3A.—Formal correspondence between the disarticulated variables beyond the calf-adult domain of reference.

Fig. 3B.—Contingent adult in the ontogenetic time-line equated with contingent adult in the phylogenetic time-line. In this diagram *a*, *b*, *c*, a^1, b^1, c^1, have the same connotations as in diagram A.

'Foetus' is here used in a special sense: unqualified, it means a whale foetus of length $L_{p\,k^1}$ (see Fig. 2E); as a 'realised foetus', it means a whale foetus of any length between $L_{p\,k^1}$ and $L_{p\,t^1}$ (see Fig. 2C).

If ${}_pL_{k^1}$ and ${}_aL_{k^1}$ are, as suggested, phylogenetic norms, they are also, insofar as they persist, ontogenetic norms. Now, the problem of equating the disarticulated variables is found to involve the equating, in some fashion, of ontogenetic history with phylogenetic history. Hence it seems convenient to choose out of ${}_pL_{k^1}$ and ${}_aL_{k^1}$ one component to be treated (along with its associated variable component for minimum length) from its individual aspect, while the other invariable component, with its associated variable component for minimum length, is treated from its racial aspect. On several obvious grounds, it would seem natural to select the adult disarticulated extra-universe moiety as the phylogenetic time-line, functioning essentially as vehicle for continuous existence, and the calf moiety as the ontogenetic time-line, functioning essentially as vehicle for discrete existence.

The results of the analysis of the time-lines, and the bringing of them into formal correspondence on the basis of the subsistence, recognised earlier, of ordinal equivalence between ${}_pL_{k^1}$ and ${}_aL_{k^1}$ are shown in Fig. 3A. The disarticulated variables, regarded as time-lines, are marked abc and $a^1b^1c^1$, the correspondence between a and a^1 being mathematically one of zeros, biologically one of zygotes *in esse* and *in posse*, the correspondence between b and b^1 being that of the ordinal equivalence between ${}_pL_{k^1}$ and ${}_aL_{k^1}$ just noted, the correspondence between c and c^1 being that of extra-universe origins: everything to the left of cc^1 lies outside the domain of definition, while to the right of cc^1 the variables, elsewhere disengaged, are articulated as the variates on which the regression equation is based. The figure is otherwise self-explanatory.

In Fig. 3B, in which a, b, c, a^1, b^1, c^1 have the same connotation as in Fig. 3A, attention is called to the fact that the whole ontogenetic time-line ad (that is, the duration of ${}_aL_{k^1}$, or ${}_aL_t$) is that of contingent adulthood, and is hence the formal correlate of a^1b^1 (that is, the duration of ${}_aL_{k^1}$, or d) the phylogenetic time-line of contingent adulthood. It is assumed the equivalence may be extended to cover the linear dimensions characteristic of these durations. Hence, if ad is, for a whale of biological minimum, or of otherwise typical, size, say, 150 $\pm$ 30 cm., this would be the expected value also for a^1b^1: the difference in sign between a^1b^1 and ad when these are transferred to an algebraic context (the former then becoming ${}_aL_{k^1}$, and the latter, in the absence of an available symbol in ${}_pL$, becoming ${}_aL_t$) would presumably symbolise the difference between them in respect of individuation, ad being, in sum, individual at adult level (for meaning of individual at adult level, see Fig. 3A), while a^1b^1 is pre-individual, a result that is, in effect, a restatement of that obtained above in subsection B *(f)*.

In this treatment the problem has been subjected to some artificial simplification in two ways: first, by the assumption of the subsistence of identity of meaning between 'adult', which as used in connexion with the original data refers to animals of modal maximum size (*i.e.*, at full physical maturity), and 'sexually mature'; secondly, by the adoption of a convention in accordance with which parenthood is taken to follow adulthood (in the sense of physical maturity), whereas it characteristically precedes it. These are, it will be found, however, merely formal simplifications, the adoption of which does not invalidate the main conclusions, but serves to facilitate their exposition.

Summary

1. Eclectic estimates of length of calf at birth, L_{pt}, and modal maximum length of adult, L_{at}, in ten species of whales (ranging in size from the Common Porpoise to the Blue Whale) yield a highly significant linear regression of neonatal on adult length, the equation of the best fit for the ten pairs of variates being (dimensions in cm.)

$$L_{pt} = 0{\cdot}2441\ L_{at} + 44{\cdot}3$$

2. The intercept, c, of the graph on the x-axis (44 cm.) formally denotes the length of the calf of a whale of zero length, and the intercept, d, of the graph on the y-axis (-182 cm.) formally denotes the length of a whale characterised by giving birth to a calf of zero length. These dimensions clearly transgress the limits of the domain of definition of the calf-adult size-ratio problem; and appear to be, on the face of it, merely biological fictions. An attempt is made, however, to find biological meanings for them.

3. The general technique of investigation may be described as 'conceptual bracketing'. Lengths are dissected to give 'composite lengths', each the sum of a constant and a variable. A comparable bracketing of the biological concepts associated with the component dimensions is then carried out. The validity of the procedure is provisionally accepted with a view to ascertaining the results that flow from the assumptions made; and it appears that biologically intelligible meanings can be found for the apparently biologically non-significant extrapolations noted in paragraph 2 above. The introduction of temporal sequence and duration, not formally inherent in the variates, into the region external to the original domain of definition is involved as a necessary feature in the interpretation proposed for c, and it also enters into one or more of the possible interpretations of d.

4. Of the two components of composite calf length, the constant c, or its conceptual correlate L_{pk^1}, is interpreted as an ordinal character, having a common and invariable manifestation in foetuses of all species, and the variable $(L_{pt} - c)$, or its conceptual correlate L_{pv^1}, is interpreted as a specific character, directly proportional to adult length. On L_{pk^1} being set earlier in time than L_{pv^1}, there emerges a picture of cetacean embryonic history as a two-phase pattern, one phase beginning at birth and culminating, at a length of about 44 cm., in the achievement of morphological specificity, the other phase continuing till birth, and being largely given over to increase in mere bulk. In four balaenopterids the approximate age at which the ordinal-specific crisis occurs would appear to be 3-4 months. For the actual existence of such a hypothetical pattern, here formulated by a train of purely formal reasoning from an examination of the neonatal-adult length regression, some direct evidence is available in the case of two or three species.

5. The variable component of composite adult length is ordinary adult length L_{at}, with conceptual equivalent L_{at^1}. The constant component d, or its conceptual correlate L_{ak^1}, may be without necessary or recognisable biological significance. If biologically significant, it is perhaps most likely to be interpretable as *(a)* an index, coördinate with the (geometrically) ordinal intercept and the gradient of the regression line, of an esemplastic biological optimum not yet diagnosed (possibly

an area-volume relation); or *(b)* an extra-somatic segment of a body-axis, constituting part of an external framework of reference, and susceptible, on appropriate geometrical transformation, of direct interpretation in terms of ordinary somatic landmarks and dimensions; or *(c)* a dimension, presumably total length, of a cetacean archetype.

6. A development of *(c)* in paragraph 5 above leads to the primary variables being disarticulated at the level of biologically minimum size, treated as ontogenetic and phylogenetic time-lines, and brought into correspondence. It is found the duration of $L_{a\,k^1}$, now indentified as phylogenetic contingent adult length, is equated with the duration of $L_{a\,v^1}$, or $L_{a\,t}$, now identified as ontogenetic adult length. Hence, if $L_{a\,t}$ is associated with a linear dimension of, say, 150 $\pm$ 30 cm., this will be the expected value also for $L_{a\,k^1}$; the difference in sign, in an algebraic context, being symbolic of a difference in individuation, the former being, in sum, individual, the latter pre-individual.

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TABLE I

REGRESSION OF NEONATAL LENGTH, L_{pt}, ON ADULT LENGTH, L_{at}:

TEN SPECIES OF WHALES

Data from various sources (see Text)

Species	Assumed Adult Length, L_{at} cm.	Neonatal Length, L_{pt}, cm.		L_{pt} (predicted) as Percentage of L_{at} (assumed)
		Assumed	Predicted	
Phocaena phocaena Linné	175	80	87	49·7
Delphinus delphis (Linné)	260	105	108	41·4
Lagenorhynchus albirostris (Gray)	300	125	118	39·2
Tursiops truncatus (Montagu)	350	130	130	37·1
Balaenoptera acutorostrata Lacépède	910	270	266	29·3
Physeter catodon Linné	1600	415	435	27·2
Balaenoptera borealis (Lesson)	1630	450	442	27·1
Megaptera nodosa (Bonnaterre)	1680	460	454	27·0
Balaenoptera physalus (Linné)	2400	650	630	26·2
Balaenoptera musculus (Linné)	2750	700	715	26·0

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The Geology of the Country around the Great Lake, Tasmania

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(Communicated by Professor S. W. Carey)

PLATES II, III and FIGS 1-3

This paper deals with the general geology and physiography of portion of the Central Plateau of Tasmania.

The accompanying map, Plate II, shows country which lies both east and west of the Great Lake.

GENERAL GEOLOGY

The only rocks in the area are dolerites, basalts and glacial deposits. Their boundaries were traversed in the field but much assistance was gained from the stereoscopic study of aerial photographs. The dolerite areas for the most part were not examined in detail but were crossed in several places.

A. JURASSIC DOLERITES

The principal rock type found is dolerite. Its differentiates have been described in some detail by Edwards (1942). Although he does not discuss examples from the Great Lake his remarks are certainly applicable to those from this locality. No petrological work was carried out on the basic rocks so there is little to add to his observations.

B. TERTIARY BASALTS

A most interesting series of rock types ranges from massive basalts to scoriaceous basalts, pumice and tachylyte breccias. The sequence is indicated on the map (fig. 2) and section (fig. 1) of Liaweene Hill. It comprises:—

	Feet
Columnar Basalt	20
Vesicular and massive basalts	15
Massive basalt	30
Vesicular and scoriaceous basalts	40
Columnar basalt	60
Tachylyte breccia, block lava, etc.	215
	380

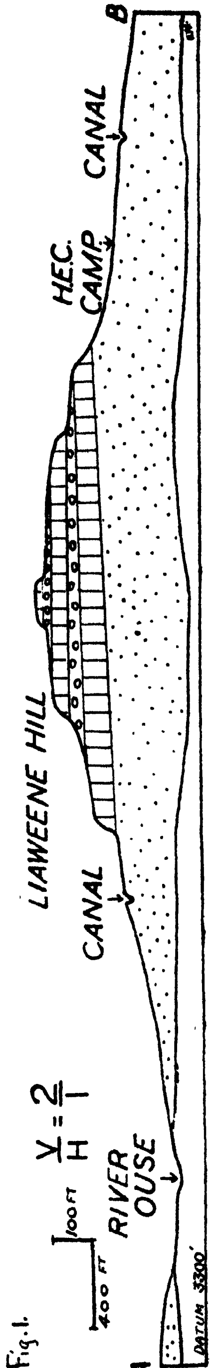

FIG. 1.—Liaweene Map.

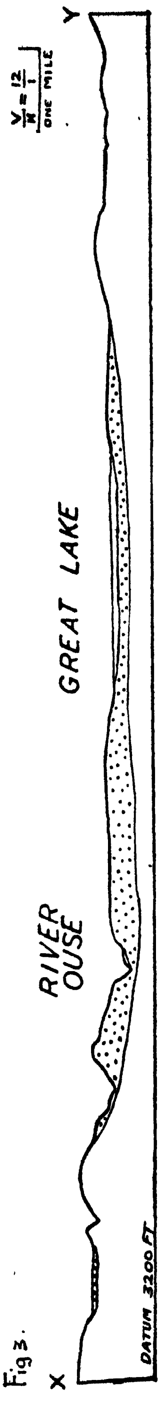

FIG. 3.—Section XY across Great Lake Area.

The lower beds are excellently exposed at places along the Liaweene Canal. Although a continuous sequence through the basal units was not examined it is thought that most of the likely variations of the unit have been revealed by excavations.

In the canal cuttings near the end of the fluming west of Liaweene Hill decomposed blocks of lava may be seen. These lie upon one another in a manner similar to the so-called 'pillow-lavas'. They are too altered to be studied at this point but further south in the canal similar blocks were found to consist of fine-grained basalt with a glassy margin. Most are rounded and between eight inches and a foot across. (See photographs, Plate III.) The tachylyte or glassy portions are up to half an inch thick. Associated with the blocks are pumice breccias in which much chabazite was seen. Crystals of this mineral line cavities or fill in the spaces between the pumice fragments. Elsewhere, tachylyte breccia also with the chabazite was abundant.

All kinds of variations in the size of fragments and proportions of tachylyte and pumice to basalt are to be seen along the canal. Particularly good exposures occur near the bridge where the Lake Highway crosses the canal.

At Liaweene Hill the breccias are overlain by massive, vesicular and scoriaceous basalts. The first flow makes a conspicuous feature particularly on the eastern side. Precipitous cliffs, which have resulted from the prismatic jointing are about 20 feet high. Above the cliffs is a flattish area with much vesicular and scoriaceous material scattered over it. This may represent the surface of the flow. Another massive flow with the prismatic jointing well developed gives rise to a second ring of cliffs. This also is followed by vesicular lavas.

A small outlier of massive basalt, again jointed, forms a small oval outcrop at the top of the hill.

The alternation of massive and vesicular lavas has produced the noticeable terracing of Liaweene Hill. It is not the site of a volcano as was indicated to previous observers by the presence of so much scoriaceous material on its sides. (Edwards 1939, p. 180.) (See Map (fig. 2) and Section (fig. 1).)

The same sequence of flows was found in a terraced hill very like Liaweene immediately west of the River Ouse. Further to the south the basalt terraces were found clinging to dolerite hills. Two such patches are isolated from the main mass of basalt west of Skittle Balls Plains.

The lavas cover a large area and much of this plain country is strewn with basalt pebbles, many being vesicular. This apparently led Edwards (1939) to the view that the plain was close to the original flat surface of the flow. While this may well be the case for a particular flow it is a reasonable inference that the massive basalts higher in the sequence once extended over the plain but have since been removed by erosion, re-exposing this surface.

A number of small basalt areas are shown on the map (Plate II), e.g.:—

(i) on the plateau between First Lagoon and the River Ouse,
(ii) South-east of Double Lagoon,
(iii) Reynolds Island,
(iv) Howell's Neck,
(v) Todd's Corner.

It would seem from the character of the lower unit that the volcanic eruptions were first of all explosive in character but later became quieter and the massive and vesicular flows were produced. The calculated thickness for the volcanic series is 380 feet but it may well have been greater as the highest flows identified are now only represented by very few outcrops and much erosion is therefore

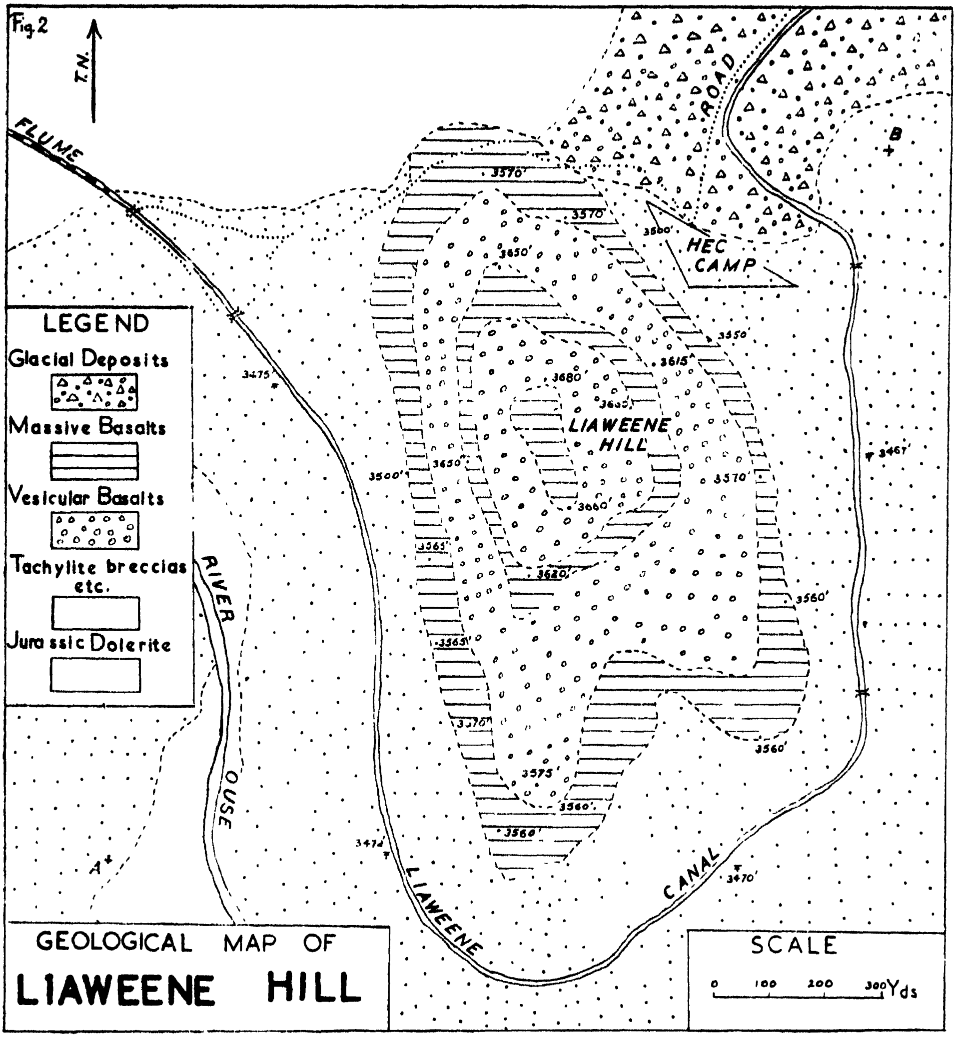

FIG. 2.—Liaweene Section.

indicated. It is probable too that the valley which now contains the basalt was not flat floored so quite a considerable thickness of lava may underlie the Great Lake.

Prider (1948) mentions a thickness of 330 feet of basalt from the valley of the River Nive and 600 feet from Wilson's Creek. Here as in the Great Lake area, the basalt fills in valleys in country which was deeply dissected at the time of the eruptions.

C. Pleistocene Glacial Deposits

Liaweene Canal exposes sandstones just east of the Hydro-Electric Commission's Camp. They are coarse-grained and laminated. Associated with them are boulders of dolerite which may well be related to the glaciation. They are indicated both on Plate II and fig. 2.

Other areas of angular boulders occur north of the canal but again it is not certain to what extent they have been moved by ice action.

A moraine partially blocks the entrance to the valley in which First Lagoon lies.

D. Recent Deposits

The alluvial deposits beside the River Ouse and other streams and the talus of dolerite on the slopes are post-glacial.

Physiography

The Great Lake occupies the central portion of the country mapped and extends some distance further to the north.

The water occupies a shallow depression and was said to average only twelve feet deep before the level was raised 30 feet by the building of the Miena Dam. This caused flooding of areas marginal to the lake. Howell's Neck and Reynold's Neck became islands; Pine Island was submerged. Dead trees in the water indicate other areas now incorporated into the lake.

The depression continues for about five miles to the west in the form of a flat treeless plain only a few feet higher than the level of the lake.

The low-lying area corresponds almost entirely with the occurrence of basaltic rocks which, in all probability, underlie most of the lake or have been stripped off the dolerite so that the water rests partly on the revealed pre-basalt surface.

This central depression is encircled by hills of variable height. On the western side is a plateau averaging about 350 to 400 feet above the level of the lake. In the vicinity of Split Rock there is a line of hills rising well above the plateau but falling very steeply into lower dolerite hills between them and the lake.

On the eastern side of the Great Lake the dolerite hills are higher, more rugged, and closer to the water than on the west. The general terrain is that of a dissected plateau. Flat floored, marshy valleys separate boulder-strewn rocky ridges and the country is difficult of access.

The hills on the east swing round towards Miena where the lake drains into Shannon Lagoon.

A basalt plain extends from Todd's Corner southwards and the country opens out in that direction. The land-forms could be dealt with conveniently under the following headings:—

(1) The Western or Liaweene Plateau.
(2) The Eastern Uplands.
(3) The Basalt Lowlands.
(4) The Islands and Peninsulas.
(5) The Miena Area.
(6) The Valley of the Little Pine River.

(1) The Eastern or Liaweene Plateau

This surface is extraordinarily level and is characterised by low rises consisting of masses of dolerite boulders separated by marshes or lakes. The map shows only part of this extensive plateau and the larger lakes such as Augusta, Ada, Chipman and Kay are beyond its limits.

The lakes shown are portion of Double Lagoon, Second Lagoon and First Lagoon. The margins of these lakes are notable for the masses of closely packed dolerite boulders which Carey (verbal communication) explains as having been due to the expansion of the lake area on freezing during the winter. The ice pushes the boulders forward along the margins. Elsewhere low brown sandhills form the shores of the lakes. The sand could be regarded as being of glacial origin accumulating during Pleistocene time.

Extending south-eastward from Double Lagoon is a low swampy area beside a patch of basalt and evidently worn out of it. North of First and Second Lagoons is another area of basalts.

The association of the lakes and the basalt does not appear to be accidental. The water seems to have accumulated in hollows caused by the action of ice in eroding the softer basalt. Glacial debris has also contributed to the interruption of the drainage as in the case of First Lagoon which is in a small glacial valley blocked by a sand bar. The valley contains much glaciated material. Its sides steepen as it descends from the plateau and the remains of a moraine of large angular dolerite boulders partially crosses it.

Other relics of the ice age are to be seen in the large boulders which are strewn through the marshes and which could not have been carried by the small water-courses which prevail.

The River Ouse traverses the plateau. In the north-western corner of the map it is in a shallow valley less than 50 feet below the general level but it gradually deepens towards the south-east. Terraced basalt cliffs form a noticeable feature where the river follows the boundary between this rock and the dolerite. The stream is deeply incised into the plateau margin forming a V-shaped gorge. A small dam diverts the water into the Liaweene Canal.

The Ouse does not show any glacial features in the section described. It flows in a valley which has the characteristics of one which has been shaped by fluvial erosion. It is interesting to note its position in close proximity to the basalt. This is a feature of many of the streams on the Central Plateau. The basalt has apparently filled its older valley and the stream is displaced laterally. This would make the Ouse not only pre-glacial but pre-basalt. Since the melting of the ice sheet there has been time for fluvial erosion to destroy the shallow glacial valley which may have been developed at the higher level.

The Plateau in places has a raised margin along the southern boundary and extending for a distance of about two miles is a steep escarpment probably due to faulting. A study of the shape of the basalt area and its margins suggests that this faulting is pre-basalt in age.

Between Double Lagoon and the Valley of the Little Pine River the country is less level and marshes are separated by rocky dolerite hills.

An interesting glacial valley with basalt on its floor has an insignificant stream in it. The suggestion is made that here again the ice sheets scooped out the softer lava which filled an earlier tributary of the ancestral Ouse.

(2) The Eastern Uplands

This country is very rugged. High ridges, some with precipitous sides, rise steeply from the Great Lake. Angular dolerite boulders are spread over the slopes and make access very difficult. Through the maze of dolerite hills run flat-floored marshy valleys.

As may be seen from an examination of the map the directions of the valleys are related in a majority of cases to structures, possibly shear zones, in the dolerite. This connection between marshes and structure lines was noted also by Prider in the Tarraleah area (Prider 1948, p. 128). In both places the usual trend is N.W.-S.E.

(3) The Basalt Lowlands

Apart from the basalt on the Liaweene plateau it could be stated that in the area as a whole the basalt occupies the low land, the dolerite the high. A few basalt hills are present such as Liaweene Hill and other terraced spurs close to the plateau.

The basalt plain is treeless and gently undulating. Edwards (1939, p. 180,) regards the surface as 'distinctly youthful' and regarded it as the surface of a flow which he considered to be post Malanna and pre-Yolande.

The present writer considers that the plain has resulted from the action of an ice-sheet and, on account of the Liaweene section through the basalts, believes that these were very much thicker and that there may have been two hundred feet or more of extrusive rock above the level of the plain.

The River Ouse, after leaving the Liaweene Plateau, cuts down deeply into the basalts, its bed being well below the level of the Great Lake. It has developed small alluvial flood plains and terraces on its sides as it has descended.

The development of the valley has been post glacial as the stream is now below the level of the glacially cut plain and, again, all its features are obviously the result of a fluvial erosion.

The Ouse cuts through a dolerite bar near Skittle Balls Plains. In order to do this the stream must have been superimposed—flowing over a basalt surface and then cutting through the basalt into the dolerite. It is deeply entrenched beside the dolerite—basalt junction where it is crossed by the 'Missing Link' Road just beyond the limits of the map. The fact that the basalt appears to be in an older valley suggests that the Ouse in this section occupies a position close to the course of its ancestor. It is possible that the basalt did not completely fill the former valley and we have an example of a confined lava field.

(4) The Islands and Peninsulas

There are a number of islands in the lake. The larger ones are low lying and composed of basalt. They were originally peninsulas but were converted into islands when the height of the lake was raised by the building of the Miena Dam.

The dolerite islands—Helen's Island, Brandon's Island and Maclanachan's Island are smaller and rougher. Legge (1904) described columnar basalt at water level at Helen's Isle. This was not observed but may now be below water level. The higher rocks are apparently fine-grained dolerite which is also broken by jointing. The peninsulas in the southern part of the Great Lake are generally composed of basalt. They are all low-lying.

North of Lake Elizabeth a dolerite peninsula on which are low rocky hills projects far into the lake, restricting its width to about two miles.

(5) The Miena Area

The outlet to the Great Lake at Miena is through dolerite into the Shannon Lagoon thence to the Shannon River. Lewis (1934, p. 25,) made the suggestion that 'the Great Lake once drained to the Lagoon *via* Todd's Corner'. The basalt is filling an old valley and would be well below the level of the lake. The

present writer prefers to believe that a pre-glaciation and therefore a pre-Great Lake stream occupied the valley and that the dolerite ridge was exposed by the ice-sheet which scooped out the basalt behind it and rode over the harder rock. The lake then spilled over at the lowest point and cut downwards. The projecting dolerite mass north of Todd's Corner may have protected the more easily eroded basalt in that neighbourhood.

(6) The Valley of the Little Pine River

The Little Pine River, east of Lake Fergus which lies just beyond the western margin of the map, flows in a typical glacial valley. The floor is flat and marshy and the river has a number of small bends. It takes an almost right-angled turn near Skittle Balls Plains and flows south through wide marshes.

Terraced basalt outcrops lie high up on the western side of the valley suggesting that it too was once partially filled with the lava.

Physiographical History

The writer's interpretation of the physiography involves the following series of events.

The dolerites which were injected into Triassic and Permian sediments in Jurassic times were exposed by erosion and during early Tertiary times were eroded by streams which made their greatest progress along planes of weakness.

As pointed out by Carey (1946, p. 34) the lower Tertiary peneplain was broken up during the early Miocene by faulting, the Central Plateau was formed, fringed by the Great Western Tiers.

Within the Plateau there was some faulting and it is possible that there was some structural background leading to the development of a stream system in the Great Lake area during the late Tertiary.

Violent outbursts of volcanic activity gave rise to a thickness of some hundreds of feet of basaltic material. This may have almost filled the depression and the subsiduary streams. I would not be inclined to regard the basalts on the Liaweene Plateau as 'older' and the Great Lake basalts as 'younger' as indicated by Lewis (1946, p. 45) though they are separated by 300 to 400 feet. The plateau lavas appear to be merely higher flows in the series or to have arisen from the outpouring of basalt at higher levels. Consequent upon the filling of the earlier depressions there was much disorganisation of drainage. A stream system developed on what was predominantly a basalt surface in the vicinity of the Great Lake.

Probably before the onset of glaciation fluvial erosion had cut valleys into the soft basalt deposits in preference to the dolerite. Ice action further lowered the basaltic areas re-exposing in parts the pre-basalt surface. Along the western margin of the plain what are probably pre-basalt fault-scarps have been revealed.

It is probable that a major ice sheet in the present position of the Great Lake moved southward, over-deepening the land in places and riding over dolerite ridges such at that at Miena. When it melted, water accumulated in the depression, flowing over the Miena ridge at its lowest point.

Streams on the Liaweene Plateau had to fall over an escarpment to the lower basaltic area. As they occupied different positions from those which they had prior to the volcanic eruptions they cut gorges into the plateau margins. The River Ouse is an excellent example of this. Some rejuvenation is apparent almost everywhere that there is a dolerite-basalt contact.

Conclusion and Acknowledgements.

This paper is the outcome of geological work carried out for the Hydro-Electric Commission of Tasmania during January and February, 1948, and I desire to thank the Commission for permitting its publication. I am also grateful to Professor S. W. Carey for his helpful advice, hospitality and many kindnesses.

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PLATE II

Map of the Great Lake Area.

PLATE III

FIG. 1.—' Block ' lavas exposed by canal near end of fluming, Liaweene.

FIG. 2.—' Block ' lavas, etc., exposed by canal with overlying columnar basalts above half a mile south of dam, Liaweene.

FIG. 3.—River Ouse in shallow valley on Liaweene Plateau.

FIG. 4.—Entrance to canal shown looking south from Liaweene Plateau through Ouse gorge. Hills in foreground are dolerite. Liaweene Hill in the middle distance is basalt.

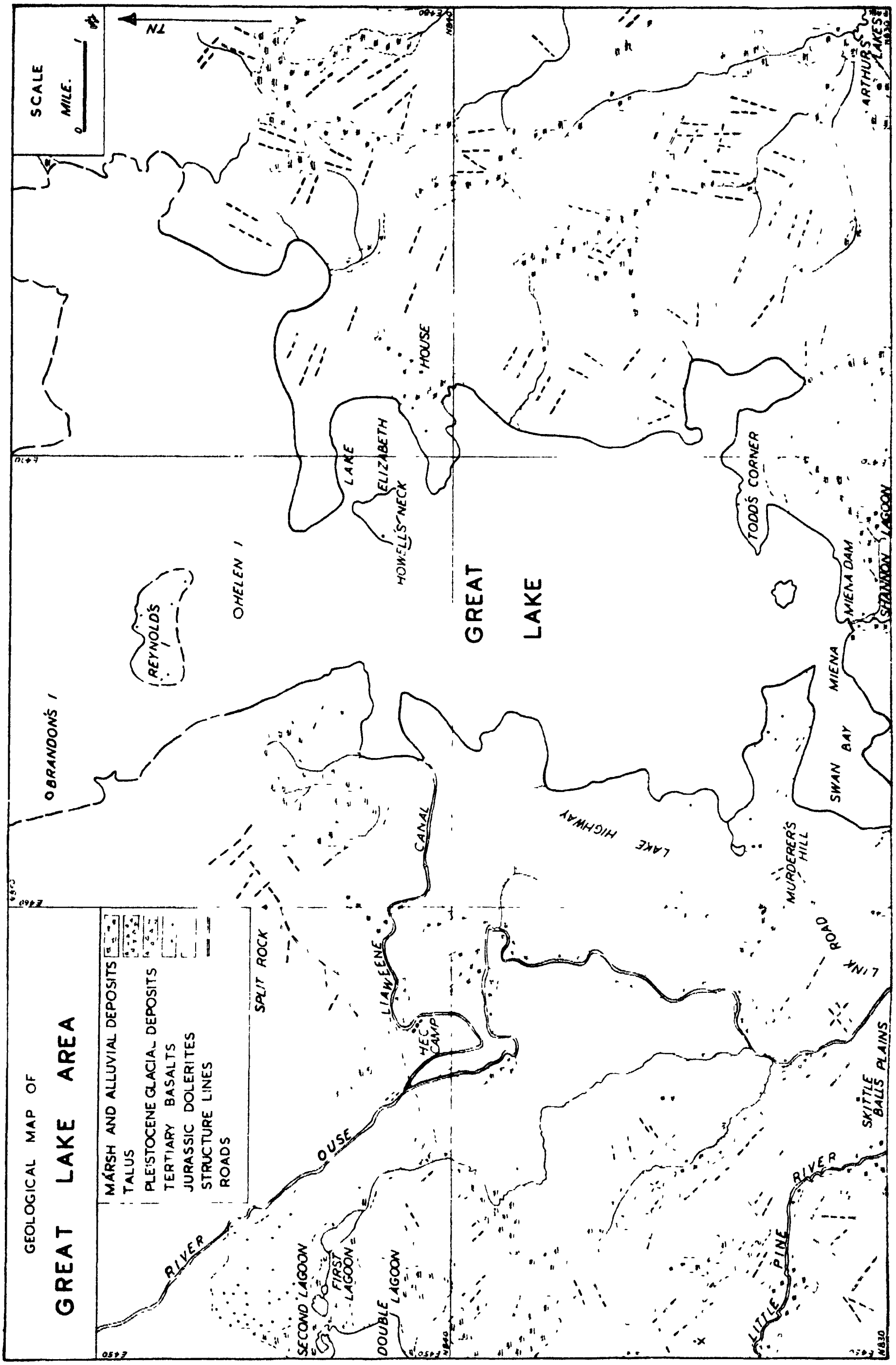
GEOLOGICAL MAP OF
GREAT LAKE AREA
MARSH AND ALLUVIAL DEPOSITS
TALUS
PLEISTOCENE GLACIAL DEPOSITS
TERTIARY BASALTS
JURASSIC DOLERITES
STRUCTURE LINES
ROADS
SCALE
MILE
TN
GREAT
LAKE
REYNOLDS
OBRANDON'S I
HELEN I
LAKE
ELIZABETH
HOWELLS NECK
HOUSE
TODDS CORNER
MIENA DAM
SHANNON LAGOON
MIENA
SWAN BAY
ARTHURS LAKES
LAKE HIGHWAY
MURDERER'S HILL
LINK ROAD
SKITTLE BALLS PLAINS
LITTLE PINE RIVER
LIAWEENE CANAL
SPLIT ROCK
HEC CAMP
RIVER OUSE
SECOND LAGOON
FIRST LAGOON
DOUBLE LAGOON

Fig 1

Fig 3

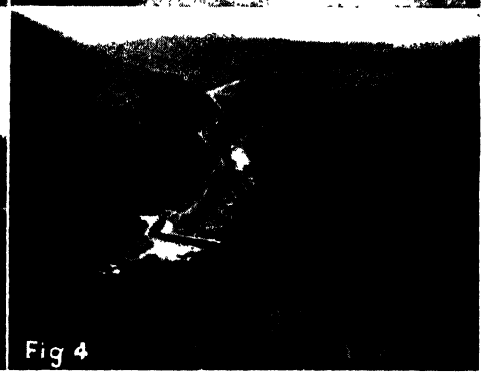

Fig 4

PAP. & PROC. ROY. SOC. TASMANIA, 1948 (15TH SEPTEMBER, 1949)

The Geology of the Country between Arthur's Lakes and the Lake River, Tasmania

By

ALAN H. VOISEY

Department of Geology and Geography, the New England University College, Armidale

(Communicated by Professor S. W. Carey)

PLATE IV and FIG. 1

INTRODUCTION

The country between Arthur's Lakes and the Lake River shown on Plate IV is drained in the western part by Tumbledown Creek and Jones Rivulet which flow into the Eastern Lake, and in the eastern by the tributaries of the Lake River. The escarpment of the Western Tiers marks the eastern margin of the Central Plateau of Tasmania.

Mapping was carried out with the assistance of aerial photographs and the structure-lines of the dolerites were obtained from them.

This paper is submitted as a small contribution to the aerial mapping of Tasmania.

GENERAL GEOLOGY

Three main groups of rocks were found outcropping in the area mapped.

(i) A series of metamorphosed rocks of probable Cambrian age consisting of slates, quartzites and 'porphyroids' which is laced by quartz veins.

(ii) A series of fossiliferous sandstones, shales and glacial beds of Permian age.

(iii) The Jurassic dolerites which are in the form of sills injected into the other formations.

There are also deposits of glacial material resulting from the presence of the Pleistocene Ice sheets and masses of dolerite talus of more recent origin.

Alluvium occupies areas marginal to the main streams.

(1) CAMBRIAN

No fossils have been found in the metamorphosed rocks assigned to this system but S. W. Carey (verbal communication) regards them as being the equivalents of similar beds of Cambrian age elsewhere in Tasmania.

Road cuttings expose the beds in the neighbourhood of 'Parknook'. They continue south along the eastern slopes of O'Connor's Peak. Another area of them lies around E. Casey's house beside the Lake River.

The rocks are principally slates with well developed cleavages, grading into phyllites. Interbedded with them are the sheared tuffs which are called 'porphyroids'. Good outcrops may be examined along the south-eastern flanks of O'Connor's Peak.

The Cambrian beds are characterised by veins of milky quartz and fragments of these in the soil were used to determine the presence of the slates when outcrops were fèw. Bands of quartzite are present in the vicinity of E. Casey's house and were especially well developed close to 'Billop' station just beyond the northern limit of the map.

(2) PERMIAN

Permian beds outcrop on the slopes of the Western Tiers running north-west from the vicinity of W. Casey's house. Another belt runs along the side of the ridge west of E. Casey's house.

The hills north of 'Parknook' are composed of glacial beds probably corresponding to the Basal Glacial Stage (Voisey 1938). Outcrops are very poor indeed and pebbles of West Coast Conglomerate and other rock types in the soil have been used to determine the limits of this unit.

Several other small outcrops are shown on the map. It is probable that they also underlie deposits of dolerite talus and accumulations of boulders in the foothills of the Western Tiers.

Other beds may be assigned to the Ferntree, Woodbridge, Grange and Granton Stages of the Permian System. (See Voisey (1938); Lewis (1946) and Prider (1948).)

The only section which gives any continuous sequence is that just west of W. Casey's house along the Hydro-Electric Commission's Pipeline Survey line between pegs 1 and 13. Even here outcrops leave much to be desired though it is possible to recognise some of the established horizons. Laterally, from this section the vegetation cover and presence of much dolerite talus made mapping of the beds virtually impossible.

The section measured from the Lake River thence up the traverse line reveals a maximum of 1500 feet of sediment but exposures on the low ground are rare and intermittent. Higher in the sequence on the steeper slopes sandstones and mudstones containing marine fossils outcrop. These probably correspond to the Granton facies. Conglomerates which indicate the presence of the Woodbridge Stage follow. About 600 feet below the dolerite base, which here is at approximately 2100 feet, lies the Risdon Sandstone horizon (Carey and Henderson, 1945). The remainder of the section consists of light coloured mudstones of the usual Ferntree type. Occasional fossils were found in this unit.

No comprehensive collection of fossils was made but the usual Permian suite including *Spirifer*, *Martiniopsis*, Fenestellidae &c. is present.

(3) JURASSIC DOLERITES

Most of the area is comprised of dolerite. The rock is particularly conspicuous along the north-eastern margin of the Central Plateau where the main sill is approximately 2000 feet thick. The igneous rock also occupies the foothills forming, among others, the prominent O'Connor's Peak.

Although faulting has been responsible for the lower elevation of the dolerite in some parts of the area there is at least one lower sill of considerable thickness as can be seen by a study of the section (fig. 1).

Variations in the petrology of the dolerite mass have been described in some detail by A. B. Edwards (1942). Prider (1948, p. 142) noted that 'at the actual igneous contacts the dolerite is very fine-grained, dense and microporphyritic, consisting of small phenocrysts of olivine, augite, and plagioclase in an aphanitic groundmass'. Several feet from the contact the dolerite is coarser and grain size is not significant in determining whether the contact is intrusive or faulted.

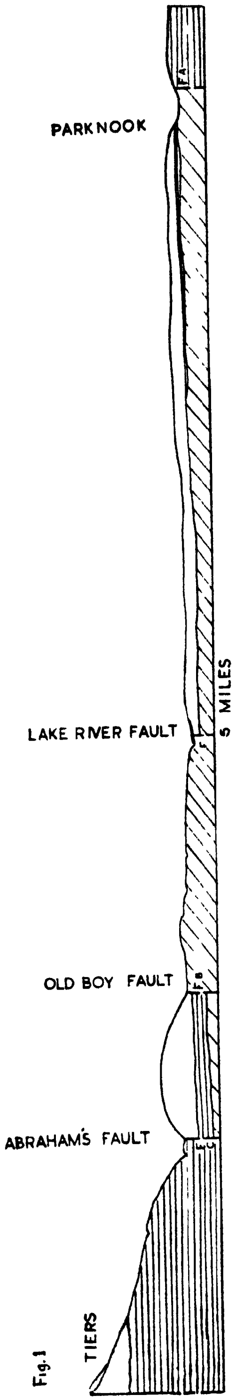
PARKNOOK
LAKE RIVER FAULT
5 MILES
OLD BOY FAULT
ABRAHAM'S FAULT
TIERS

Fig. 1

The dolerites have been broken down by weathering processes into boulders which aré concentrated on the steep slopes to form deep and extensive masses of talus as indicated on the map. Besides the areas which are almost entirely composed of this loose material the lower slopes are strewn with boulders which obscure most of the underlying Permian formations. These sedimentary beds may be overlooked altogether where they are weathered deeply and only occasional boulders of dolerite protrude through the soil cover.

Geological Structures

The Cambrian suite has been tightly folded and metamorphosed, dips ranging from 45° to 50° usually to the north or north-east.

The Permian strata dip gently, apparently at only a few degrees.

The dolerite is in the form of two or more large sills. The lowest has been injected along the unconformity between the Cambrian and Permian formations. Some of the basal Permian conglomerates appear to have been caught between the dolerite and the Cambrian basement as pebbles of rocks similar to those in the conglomerates have been found along the south-easterly slopes of O'Connor's Peak and on the north side of Little Billop just north of the area mapped. Pebbles were also found along the eastern face of the ridge which runs west-north-west from E. Casey's house forming an interfluve between Dabool Rivulet and Abraham's Creek. This ridge, together with O'Connor's Mount and Little Billop is composed of the dolerite of the lower sill.

The higher sill has invaded the Ferntree mudstones probably in a position very close to the junction between the Permian and Triassic systems. Between the two main sills there may be others because the Permian sequence south of W. Casey's house appears to be broken by sheets of dolerite in several places

Large faults have been responsible for breaking the north-east section of the area into a number of blocks. S. W. Carey (1946) discusses them in a general way as the 'Western Tiers Fault System'. He shows diagrammatically (p. 38) two faults giving rise to a step between the lowlands and the Central Plateau. He states that the faults all seemed to be normal with steeply dipping fault planes showing little evidence of strike-shift movement. Carey gives the age of this faulting as Lower Miocene.

The faults indicated on the map (Plate IV) have been determined principally by field work assisted by the stereoscopic examination of aerial photographs.

Fault A which might be referred to as the Parknook Fault is demanded by the relationships between dolerite, Permian and Cambrian outcrops and its presence is supported further by the anomalous steep dips of Permian sandstone outcropping on the hilltop just west of the point where the road crosses the fault.

Fault B or Old Boy Fault is easily picked out by the topography as it lies along the front of a high dolerite ridge. Fault C or Abraham's Fault is responsible for the steep southern slope of this ridge. It brings the dolerite up against the Permian sediments.

The western limits of these faults could not be determined satisfactorily because of the thick vegetation cover, poor outcrops and scattered dolerite boulders. The apparent termination of Old Boy Fault against the escarpment of the Tiers strongly suggests that a major fault runs along the cliffs. This could perhaps change its direction and pass into Abraham's Fault.

Yet another fault which may be referred to as the Lakes River Fault must run in a north-easterly direction under the flats of the Lake River and thence along the lower part of Dabool Rivulet. This is demanded by the presence of Cambrian

beds around E. Casey's house, west of the river. As the O'Connor's Peak sill dips gently to the west it is difficult to account for this occurrence without postulating such a fault. No outcrops of the fault were seen so it is not marked on the map.

Fault D or O'Connor's Fault has been inferred because a steep sided valley is shown on the aerial photographs in this position and structure-lines strongly suggest such a fracture.

In addition to these larger faults there are a number of small dislocations, shears and joints in the rocks, particularly in the dolerite. These structure lines are conspicuous on aerial photographs and are shown on the map. Prider's map of the Tarraleah Area (Prider 1948) shows similar 'shear zones'. Carey (1946 pp. 36-37) says of those on his map 'there are two pronounced systems of joints which show up strongly on the aerial photographs. One trends north-west and the other north-east. Movement in these directions varies considerably, the structures ranging from joints with little or no movement to important shear zones'.

PHYSIOGRAPHY

About three-quarters of the area mapped consists of a glaciated plateau and the other quarter includes portion of the marginal escarpment and foothills. Most of the Eastern and portion of the Western of the two Arthur's Lakes are included.

The surface of the plateau is very uneven though most of it lies between 3700 and 4200 feet. The highest point, Brady's Lookout, rises to 4497 feet.

Numerous marshes separate boulder-strewn dolerite ridges. These marshes are practically treeless but the rocky hills support stunted eucalypts. Ice action has resulted in the formation of lakes and marshes and the deposition of many large boulders. The last named are very wide-spread—practically every marshy area having a share.

Inequalities in the pre-glacial surface may have been tectonic in origin but fluvial erosion must have played a large part in shaping the country. There does not seem to be any real evidence to suggest that Arthur's Lakes are in a down-faulted area although there could be a fault along the boundary of the higher western block which starts close to the western margin of the map (Plate IV).

It is probable that the lakes are due to the action of an ice-sheet which over-deepened what was previously a wide river valley. Morainic material lies at the southern end of the Western Lake.

Little Lake is one typical of glacial origin. It drains into the Eastern Lake through Jones Rivulet—a small stream in a wide flat valley.

The eastern escarpment of the Central Plateau forms the well known Western Tiers which rise 4000 feet above the central valley of Tasmania. Faulting along it and the geological history of the Launceston District have been dealt with by Carey (1946).

To some extent the Lake River shows the characteristics of an antecendent stream. In the south-east corner of the map where it is following the junction between Cambrian and Permian rocks—both more easily eroded than dolerite—it has a wide flood-plain. The valley narrows rapidly where the stream cuts through dolerite and a narrow gorge is developed. It widens once more where the Cambrian beds are met near E. Casey's house. Again the valley is restricted in the dolerite country west of O'Connor's Peak, widening out once more in the Cambrian area shown in the north-east corner of the map.

Acknowledgments

The investigations which led to the mapping of the country just described were carried out for the Hydro-Electric Commission of Tasmania and I desire to thank the Commission for allowing me to publish this paper.

I am deeply indebted to Professor S. W. Carey, Geological Consultant to the Commission who introduced me to the area and whose advice and assistance were most welcome. I also desire to thank Mr. Frank Brown of Hobart and Mr. William R. Blevin of New England University College, Armidale, for their assistance in the field.

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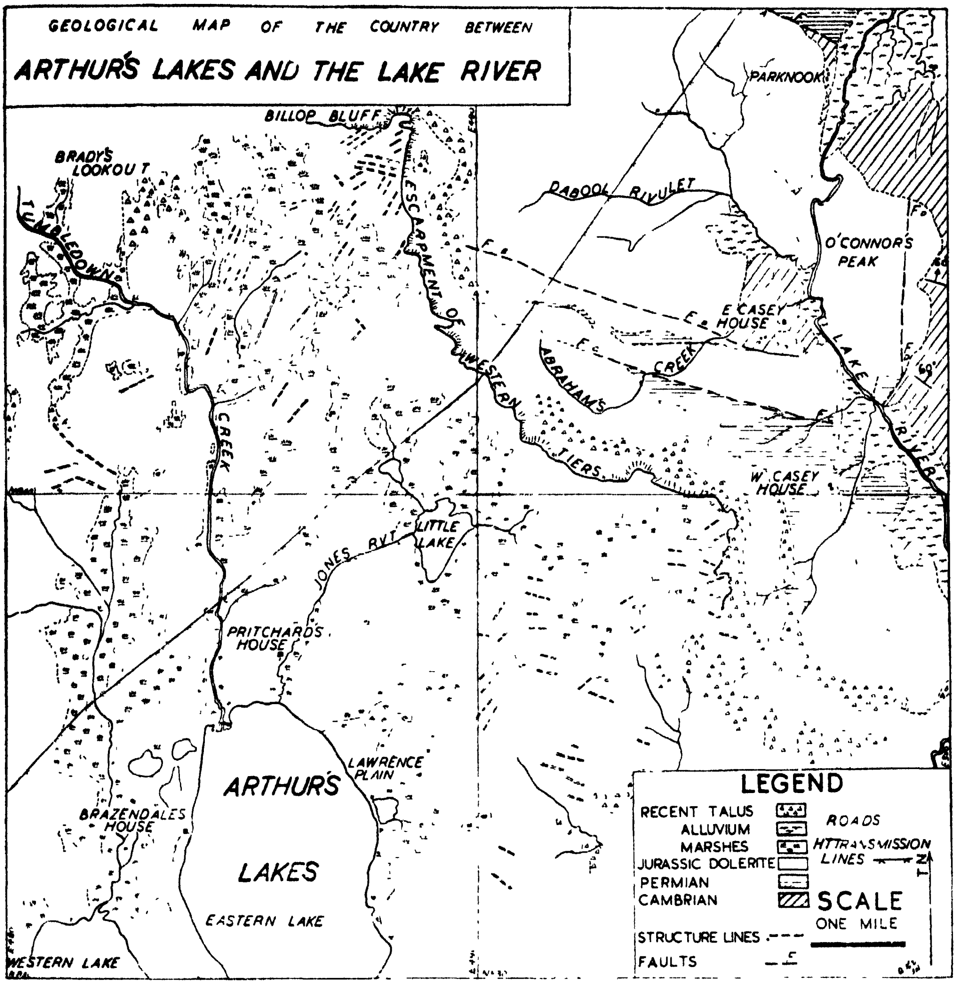
GEOLOGICAL MAP OF THE COUNTRY BETWEEN
ARTHUR'S LAKES AND THE LAKE RIVER
BILLOP BLUFF
BRADY'S LOOKOUT
TUMBLEDOWN
CREEK
ESCARPMENT OF WESTERN TIERS
DABOOL RIVULET
PARKNOOK
O'CONNOR'S PEAK
E. CASEY HOUSE
ABRAHAM'S CREEK
LAKE RIVER
W. CASEY HOUSE
LITTLE LAKE
JONES RVT
PRITCHARD'S HOUSE
LAWRENCE PLAIN
ARTHUR'S LAKES
EASTERN LAKE
BRAZENDALE'S HOUSE
WESTERN LAKE
LEGEND
RECENT TALUS
ALLUVIUM
MARSHES
JURASSIC DOLERITE
PERMIAN
CAMBRIAN
STRUCTURE LINES
FAULTS
ROADS
HT TRANSMISSION LINES
SCALE
ONE MILE

PAP. & PROC. ROY. SOC. TASMANIA, 1948 (15TH SEPTEMBER, 1949)

Geology of the Country around Waddamana, Central Tasmania

By

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(Communicated by Professor S. W. Carey)

PLATES V-IX, FIGS 1-8

I. INTRODUCTION

This survey covers an area of about 17 by 23 miles in Central Tasmania, with Waddamana rather to the north of centre, and including Lake Echo in the west and the Lagoon of Islands in the north-east. The boundaries of this block on the Australian Military Grid are 450,000 to 490,000 yards E. and 790,000 to 820,000 yards N. These correspond very approximately to latitudes 42° 19′ S. and 42° 04′ S. and to longitudes 146° 33′ E. and 147° 00′ E.

The area was surveyed on behalf of the Hydro-Electric Commission of Tasmania during January and February of 1947. This was only a rapid reconnaissance survey, but it was based largely on air photos supplemented by field work on important sections in many parts of the area. In this way we present the first detailed geological map (on a scale of four inches to the mile) of a fairly large block of Central Tasmania. Nevertheless, its limitations must be emphasised and a great deal more field work could be done with value in this area.

It is not known who was the first geologist to visit this region about Waddamana; possibly it was Strzelecki who carried out important traverses in this part of Tasmania more than a century ago. In his classical work (1845) he described briefly the Permian section in Serpentine Creek (Marlborough) which lies a short distance off the north-west edge of our map area (see Prider, 1948). He did not, however, describe, any section in the Waddamana area. Jukes (1847) only outlined the general sequence found in this part of Tasmania.

R. M. Johnston, in his general geological work on Tasmania (1888), also failed to describe any section throughout this large area, but on his map he indicated very roughly the presence of 'diabase' or 'greenstone' over three-quarters of the map area in the north, north-west and west, with 'Permo-Carboniferous' reaching up to 'Ebrington' (Hermitage) in the south-eastern part, a general areal distribution which has been borne out by the present survey. Stephens (1898) reported that the only area of older Palaeozoic and pre-Cambrian in Central Tasmania lay between Lake Echo and the River Nive, but this appears to have been an error, possibly mistaking locally metamorphosed Trias for these.

David's Geological Map of Australia (1931) included an inset of Tasmania, which showed, in addition, some patches of Tertiary basalt in this area, while the latest map to depict the geology of Tasmania, appearing in the State Atlas of Tasmania (1947), indicates no further details in our region. The area was included in a broad physiographic reconnaissance of the Central Plateau by Lewis

(1933), while Edwards has examined its basalts (1939) and its dolerites (1942). No work at all has been done on the Permian or Trias sequences, though a valuable regional survey of the Tasmanian Permian has been made by Voisey (1938). To date, therefore, it appears that only generalized accounts of rapid traverses in this area have been published.

The following work breaks a good deal of new ground, but, at the same time, must only be regarded as the report of a general reconnaissance, to which has been added a discussion on the broader implications in the regional geology.

Justification for the latter was obtained by means of a study of the literature, coupled with regional reconnaissances over Central Tasmania, and, in addition, the West Coast, the Northern and North-western Tiers, the Midlands, Hobart area and Derwent Valley. The friendly and stimulating company of Professor S. W. Carey and Dr. R. T. Prider on several of these trips was particularly appreciated. Valuable help in the field was contributed by student assistants, especially W. K. Sneddon, and later B. Motten and A. A. Northey.

Acknowledgments must be made herewith to the Hydro-Electric Commission of Tasmania, which has kindly given permission for the publication of this report, and whose officers facilitated the survey in every possible way; to Professor S. W. Carey, their geological consultant, and to Dr. R. T. Prider, my colleague, who carried out a similar survey in the region immediately to the west. The use of Dr. Prider's map covering the Dee area in the extreme south-west of the present block is gratefully acknowledged. Dr. Austin Edwards has been kind enough to check carefully through the Ms.; Dr. C. Teichert and Dr. A. Voisey have also read it and assisted me with their comments. Mr. H. O. Fletcher, of the Australian Museum, Sydney, has kindly examined and identified the fossils.

II. Physiography

The Waddamana map area may be divided, physiographically, roughly into four equal parts. In the south-west, north-west and north-east there is a high plateau underlain by dolerite rocks, sloping in a more or less southerly direction from elevations of about 3100 feet in the north down to about 2000 feet in the south. The north-west segment includes Lake Echo, east of which broad areas of basalt form a cover over the dolerite (e.g., Bashan Plains). The north-eastern segment includes the Lagoon of Islands and a smaller amount of basalt on the upper part of the Shannon. The south-western part includes lower slopes and plateaux of dolerite and, again, some areas of basalt east of the Dee. In the south-east segment there are more gentle rolling hills and valleys conditioned by the occurrence of sediments (sandstones and mudstones) of Permian and Trias age; the elevation varies from about 2000 to 1500 feet.

There are no true mountain ranges or peaks in this regionally elevated area, but a few hills rising above the plateau are referred to as ' Sugar Loaf '. In this way there are Fisher's Sugar Loaf, south-west of Waddamana (over 2800 feet), Goldie's Sugar Loaf, south of the Lagoon of Islands (over 2700 feet), and Synnot's Sugar Loaf, north of Hermitage (about 2200 feet).

The entire region is drained by three major rivers which flow roughly from north to south: the Ouse which flows almost directly down the centre of the map area, the Dee which drains Lake Echo in the south-west, and the Shannon which comes down from the Great Lake and also drains the Lagoon of Islands through a tributary in the east (Blackman's Rivulet) and joins the Ouse in the extreme southern part of the sheet. Only in the extreme south-east corner of the sheet are there a few small tributaries of the Clyde.

All the main rivers and their tributaries are deeply incised in the southern part of the sheet, but towards the north the valleys become shallower and the streams flow in only slight depressions in the surface of the high plateau. The two lakes, Lake Echo and the Lagoon of Islands, appear to be structurally controlled (see below, under Sections IV—Structure, and V—Geomorphology) and probably represent complex graben collapse structures. In general, the streams are flowing southwards over this southerly tilted plateau and must, therefore, be regarded as originally consequent streams. Deep incision, however, has revealed older structures by superposition and with younger structures antecedent features result. The detailed channels are, furthermore, in many cases considerably influenced by the structural lines of the country, almost every bend reflecting a joint, shear or fault line in the underlying geology. No river terraces of any dimensions have been recognised along their valleys.

Hydro-electric operations have produced an important diversion of the upper part of the Shannon, via a canal and the 'Penstock Lagoon', being carried by pipe-line over 1000 feet down into the Ouse Valley where is situated Waddamana, one of the principal hydro-electric power stations in Tasmania. High-tension power lines radiate from Waddamana to Hobart, Launceston and Shannon. A former line connecting with Tarraleah has now been dismantled and only the telephone line is maintained.

Rainfall in the area varies between 25 and 40 inches, but a good deal of the precipitation falls as snow in the winter-time. A good review of the climate and vegetation of the high plain region, as exemplified at Great Lake, may be found in Legge (1905). The vegetation is mostly of the native eucalypts, and relatively little has been cleared. In the south-east, however, the sedimentary sub-stratum permits a good development of the soil and more extensive pastures are cultivated. This south-eastern section coincides also rather closely with part of the less humid and slightly warmer climatic region of Eastern Tasmania, as recognised by Dr. J. Gentilli (see Map No. 25 in the Regional Planning Atlas of Tasmania, 1947). In the south-east there are the old established estates of Hunterston, Hermitage, Southern Field, Dungrove and Cluny.

The Waddamana region is serviced by a number of moderate all-weather roads, including the Lake Highway in the east and the Lyell Highway in the south-west, together with a number of very rough secondary roads and tracks. However, owing to the backwardness of the agricultural and general development of the area, there are rather large sections without any roads at all and these should best be visited on foot or horseback.

III. General Geology

1. Permian

The Permian rocks of Central Tasmania have been known for over a century. They consist largely of mudstones, conglomerates and sandstones, in places containing large accumulations of fossil remains, indicating shallow water marine conditions. At certain horizons there is a variety of medium-sized exotic boulders of Western Tasmanian origin, consisting mostly of early Palaeozoic and pre-Cambrian quartzites, schists and various igneous rocks. These have long been considered to be of glacial origin and certainly suggest the rafting and melting of ice-floes and ice-bergs. No true (continental) tillites have been found in this area. In the mudstones, sandstones and conglomerates there are many horizons containing sharp, angular fragments of various minerals, such as unweathered felspars, which also suggest a rapid sedimentation.

The Permian of Tasmania has long been recognised as being similar in many respects to that of New South Wales and an exact correlation with that State has been attempted with 'Upper and Lower Marine' series, 'Greta' and 'Tomago' series, and so on. Weaknesses in this correlation have been apparent for some time, and both Voisey (1938) and Lewis (1946) introduced local formation names. Some confusion, however, existed between the two, and R. T. Prider (1948), after consultation with Dr. Voisey and Professor S. W. Carey, proposed a general classification for the Permian of Central Tasmania, which appears to be fairly generally applicable. Briefly, the sequence is as follows:—

3. *Ferntree Formation* (of Lewis, 1946).—White unfossiliferous mudstone without pebbles, in places including a sandstone member consisting normally of equal amounts of angular quartz and fresh plagioclase grains (named 'Risdon sandstone' in an unpublished Ms. by Carey and Henderson, 1945, see Carey, 1947). This group is equivalent to the Lindisfarne 'stage' of Voisey (1938).

2. *Woodbridge Formation* (of Voisey, 1938).—Unfossiliferous, pebbly mudstone with small glacial erratics locally intercalated by a pebbly sandstone. This sequence is equivalent to the Lindisfarne formation of Lewis (1946).

1. *Marlborough Group** (of Prider, 1948.—A somewhat variable group of highly fossiliferous sandstones and mudstones. (This is more or less equivalent to the Cascades 'stage' of Lewis, 1946. See Hills and Carey, 1949.) In it three facies are recognised:—

   (a) Bronte Facies (of Prider, 1948).—A silty sandstone (rich in quartz and fresh felspars) with marine fossils. Locally it passes to mudstones. Prider interprets the material to be fluvio-glacial in origin.

   (b) Grange Facies (of Lewis, 1946).—A yellow mudstone characterised by the fossil *Fenestella* and casts of shelly forms.

   (c) Granton Facies (of Lewis, 1946).—Blue-grey calcareous mudstones with calcareous fossils.

In the present map area, Permian has been identified in a small inlier in the Ouse Valley at Waddamana, where it is partly exposed by faulting and partly by the very deep incision of the Ouse itself. It is overlain on the east by dolerite and on the west by basalt flows. The individual horizons in it are somewhat lenticular and inconstant, but the following section may be taken as a typical representative of the Waddamana sequence:—

7. Grey, sandy mudstone, with blue-grey to olive-brown sandy shales; lenticles of siliceous sandstones occur in places, and angular quartz fragments are common in the mudstones . . . . . 30 ft.

6. Yellow, silty felspathic sandstone, passing laterally into sandy shale and mudstone, with lenticular conglomerate and quartz grit bands, locally with shelly fossils . . . . 20-50 ft.

5. Yellow, sandy mudstones, with bryozoan 'reef' facies (*Fenestella*, and many other fossils). This facies may interfinger and be intercalated in the overlying sequence of silty sandstones . . . . 20-70 ft.

* I am following as closely as possible the proposed Code of Australian Stratigraphic Nomenclature, which was adopted in principle by the Australian and New Zealand Association for the Advancement of Science in 1947 (see Glaessner, Raggatt, *et al.*, 1948). As regards the Marlborough 'series' of Prider, it seems best to regard this as a lithologic group rather than as a time-rock 'series'; in this case the smaller subdivisions may be 'formations', 'members', 'lenses' or 'tongues', but as their status and relationships are as yet undetermined, I am retaining Dr. Prider's suggestion in referring to them as 'facies'.

4. Conglomeratic to sandy mudstone, yellow to reddish-brown in colour. Pebbles are mainly quartzite, but with some granite and schist. Richly fossiliferous in places, especially species of *Spirifer*, *Productus*, *Stenopora*, etc. . . . . 20-40 ft.
3. Yellow, sandy to gritty mudstone, locally very felspathic, with some quartzite, granite, gneiss, schist and blue crystalline limestone pebbles, passing to a true felspathic sandstone . . . . 50-60 ft.
2. Creamy-white to greyish mudstones, well-bedded and blocky; unfossiliferous at the top, but with many shelly forms lower down. Thin shaley partings; rare pebbles and angular quartz grains 60-70 ft.
1. Blue-grey, block mudstones, with very hard limestone concretions (up to three feet long), mostly unfossiliferous 25 ft. (plus)

Total average thickness, 255 ft.

Nowhere is the base of the sequence seen, since it disappears into the bed of the River Ouse. Even outside the Waddamana area, the base is nowhere seen in Central Tasmania.

Pebbles found in these beds range up to about six inches long as a rule; none were found to be glacially striated. Lithologically and faunistically, the Waddamana sequence corresponds fairly well to Prider's Marlborough group, with its Granton facies (our beds 1 and 2), its Grange facies (our beds 3 to 5), and its Bronte facies (our beds 6 and 7).

Fossils found in the Grange facies, in the Waddamana-Ouse Valley area (kindly identified by Mr. H. O. Fletcher, of the Australian Museum, Sydney), include—

Coelenterata

Stenopora crinita Lonsdale.
S. tasmaniensis Lonsdale.
Euryphyllum gregoriana (de Kon.).

Bryozoa

Polypora internata (Lonsdale).
P. woodsi (Etheridge).
Protoretepora ampla (Lonsdale).
Fenestrellina propinqua (de Kon.).

Brachiopoda

Strophalosia clarkei (Etheridge).
S. gerardi King.
S. jukesi Etheridge.
Terrakea fragile (Dana).
T. brachythaera (Sowerby).
Linoproductus cora var. *farleyensis* Eth.
Linoproductus sp. (Large form.)
Spirifer stokesi Konig.
S. duodecimcostata McCoy.
S. tasmaniensis Morris.
S. vespertilio Sowerby.
S. oviformis McCoy.
S. glaber Dana (non Martin).
Martiniopsis darwinii (Morris).
M. subradiata (Sowerby).
M. subradiata var. *branxtonensis* Eth.

Pelecypoda

Aviculopecten sprenti Johnston.
A. multicostata Fletcher.
A. engelhardti Eth. & Dun.
A. tenuicollis (Dana).
Deltopecten fittoni (Morris).
D. subquinquelineatus (McCoy).
Maeonia carinata (Morris).
Stutchburia compressa (Morris).
S. costata (Morris).
Modiola sp.

Gastropoda

Platyschisma ocula Sowerby.
Ptychomphalina morrisiana (McCoy).
Conularia inornata Dana.

Further downstream along the Ouse Valley, about six miles below Waddamana, the Permian reappears at the locality known as Nelson's Bend on this river. Here the mudstones outcrop in the bed of the river and up to 100 feet or so around the west and south-west sides of the valley, where they are overlain by a very massive pebbly grit horizon and succeeded by about 300 feet of sandstones. The structure at Nelson's Bend is extremely complex, for there are a series of north-north-west, north-west, west-north-west, north-east and east-north-east faults which reduce the outcrops here to a mosaic of displaced blocks. The dip is, for the most part, between 10 degrees and 20 degrees to the west and north-west. Fossils were not found in the mudstone, and it would seem that the outcrop is probably near the top of the Permian and that the overlying sandstones are possibly the lowermost Trias.

Following the Ouse Valley further south still, in the vicinity of the old road from Hermitage to Victoria Valley via Triangle Marsh (around the side of the former Butler's Bridge), a fossiliferous Permian mudstone is found dipping gently westwards with dolerite abutting it along a faulted intrusive contact on the east. This intrusive contact may be followed for about five miles in a southerly direction along the Ouse Valley, passing just to the east of McGuire's Marsh Farm and near the junction of the River Ouse and the River Shannon. Above this fossiliferous mudstone follows a series of sandstones. The character of the fossiliferous mudstone suggests the Grange facies of the Marlborough Group, and the overlying sandstones appear to be a local variation of the Woodbridge and Ferntree mudstone formations, or possibly Trias, assuming an erosional gap. It seems probable that this intrusive contact is also faulted, since no mudstone was found to the east of it, but additional sandstones were found which possess more of a Trias character, and these may be followed up the River Shannon, and, unless displaced by further faulting, would lead naturally into the sandstones overlying the Permian in the region between Hermitage and Dungrove.

The third and largest Permian outcrop appears in an asymetric dome-like structure around Hunterston. It is transgressed by dolerites on all sides, and complicated by faulting. It is only here in the north-west that northerly and easterly dips are encountered and everywhere else the dip is away to the south-west from Hunterston towards Hermitage and Dungrove. The successive horizons of the Permian follow one another in uninterrupted sequence, dipping between two degrees and five degrees in the general way towards the south-west, where they disappear beneath sandstones which may be Trias, and eventually are transgressively overlapped by dolerite.

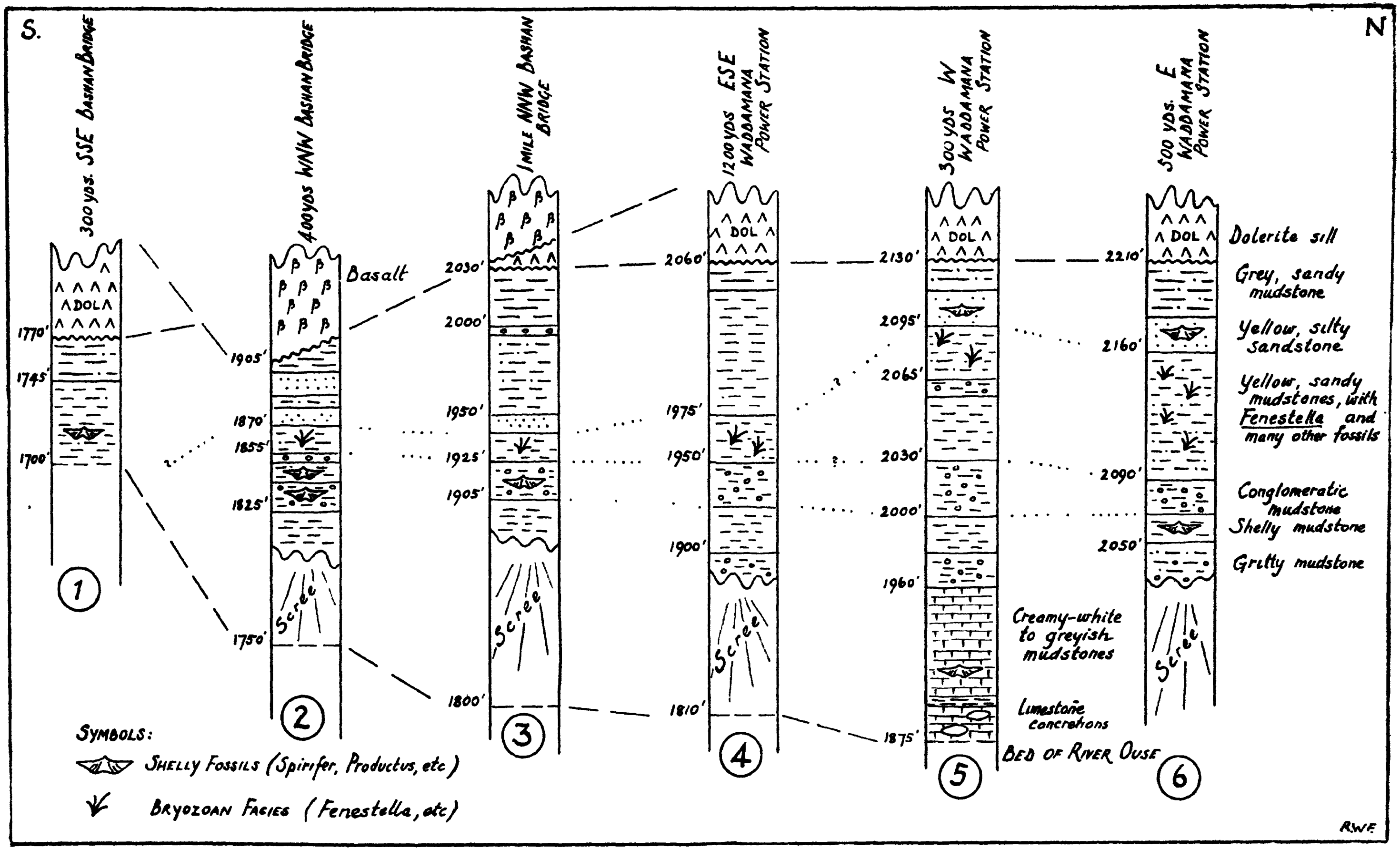

Fig. 1.—Permian stratigraphic columns in the Waddamana area.

The crest of this dome lies in the valley of the Hunterston River, about two miles east-north-east of Hunterston Homestead, where massive blue-grey mudstones outcrop, dipping three degrees north-east on the north side of the stream and three degrees or four degrees south-west on the south side. They are succeeded by about 50 feet of coarse gritty and pebbly sandstone which extends along the strike to the north-west paralleling the Lake Highway near milepost D67, where, however, it appears to wedge out and is replaced by a very fossiliferous band of yellow mudstones with *Fenestella* and various shelly fossils, *Spirifer*, *Productus*, etc.

Just below this mudstone horizon there is a thin sill of dolerite up to about 12 feet in thickness, which has had the effect of baking the overlying fossiliferous mudstones to a thickness of about 10 feet, with the result that the fossils are beautifully preserved in a very hard and resistant rock. This sill may be followed for over a mile around the northern end of the Hunterston Basin. When this same horizon is followed to the east in its sandstone phase, it is found to thicken considerably, so that at a distance of three miles due east of Hunterston Homestead, where it is overlapped by the dolerites of Front Tier, it is found to be dipping at about six degrees to the east and measures more than 200 feet in thickness.

By analogy with the lithology of the Permian in South-eastern Tasmania, we may perhaps correlate the sandstone, the *Fenestella* mudstones, and the blue-grey mudstones below, with Prider's Marlborough Group. It is overlain to the south by a thick sequence of white to creamy mudstones containing scattered pebbles and occasionally erratics of igneous and metamorphic rocks of Western Tasmanian appearance. Fossils in it are rare, but an occasional *Spirifer* was found. This formation shows an immediate analogy with the Woodbridge Glacial formation (of Voisey) and may be followed westwards along the strike, forming hills south of Hunterston Homestead and the range running north-west of Brazendale. The dip here is fairly uniformly about five degrees south-west. To the south-east of the Lake Highway the same mudstones may be followed, forming the hills east of the road and exposed by the northern tributaries of Weasel Plains Creek. Further to the south it forms an amphitheatre all round the west and south of Weasel Plains Homestead. The thickness of this mudstone (probably Woodbridge Formation) varies from 200 to 300 feet.

Overlying the probable Woodbridge mudstones, almost along the line indicated by the Hydro-Electric Commission high-tension transmission line (Waddamana-Hobart), there is a thick sequence of alternating sandstones and mudstones. At the base there is a coarse pebbly grit succeeded by yellow and white siliceous sandstones with one or two further grit horizons. This is overlaid in turn by a mudstone which is white, unfossiliferous and, in the general way, does not have the pebbles characteristic of the Woodbridge mudstones. The mudstone is succeeded by two further horizons of sandstone and mudstone respectively, each about 20 feet thick, making a total of about 150 feet.

These mudstones and sandstones are best exposed in the valleys north of Dungrove and between here and Hermitage and in the valley of the River Shannon between Hermitage and Brazendale. They also form the hillsides west of the Shannon at Brazendale. This alternating sequence in the Dungrove-Hermitage region corresponds, lithologically, with the Ferntree mudstones (and 'Risdon sandstones') recognised elsewhere in South-eastern and Central Tasmania, but it appears that the repetition of the sandstone members is peculiar to this local section to the extent that sandstones are here more important than the mudstones, whereas at Hobart the reverse is the case. No fossils were found in this upper formation. This entire sequence is conformably overlain to the south-west, roughly on a line

Hermitage to Dungrove to Cluny Park, by a massive quartzitic grit band overlain by several hundred feet of sandstones, grits and sandy shales. By analogy with the Hobart and Midlands areas, this may best be regarded as Trias *(q.v.)*.

It may be seen from the above that we have here in the region between Dungrove, Hermitage and Hunterston an extremely well-developed and relatively undisturbed sequence of Permian rocks, and this section may well repay careful examination, since in so many other localities in Tasmania inter-relationships between the different formations are obscured by faulting and by dolerite intrusions. On the contrary, in this area, apart from a few thin sills, dolerite is restricted to the margins, and there is a region about six by ten miles of well-exposed and gently dipping Permian sediments. No other outcrops of Permian are known in this area and the nearest connections are found to the north-west (Marlborough-Bronte region), to the south (Osterley-Ouse region), and to the south-east (Bothwell, Oatlands and the 'Midlands').

In broad terms it may be seen that this general sequence of Permian is to be compared with the Hobart area, or southern division of Voisey (1938). It has no coals, tasmanite oil shales or obvious freshwater intercalations; thus clearly it has less in common with the northern and western divisions of Voisey, though admittedly the absence of the basal beds prevents a complete appraisal.

2. Trias

Trias follows Permian more or less conformably, but in many places in the Hobart-Midlands area there is evidence of a hiatus and a slight disconformity (Nye, 1921, 1924), and a basal conglomerate of Permian mudstone pebbles is known. It consists mainly of unfossiliferous sandstones which are generally taken to be of freshwater origin. The sandstones are often similar to those of the Permian, although certain lithological characteristics may be found useful for field distinctions.

The generally recognised sequence of the Trias in South-eastern Tasmania is as follows (Loftus Hills and Carey, 1949):—

4. *Felspathic Sandstone Formation* (of Nye, 1921).—Felspathic sandstones of tuffaceous type, and compare closely with those of Wonthaggi in the Victorian Jurassic.
3. *New Town Formation* (of Lewis, 1946).—Felspathic sandstones, sandy mudstones, shales and coal measures (plants indicate Upper Triassic age—Walkom, 1925-26).
2. *Knocklofty Formation* (of Lewis, 1946).—Often micaceous 'sparkling' quartz sandstones, locally passing to chocolate shales, sometimes with clay-pellet (intraformational) conglomerates, the so-called Hamilton Formation.
1. *Ross Sandstone Formation* (of Nye, 1924).—Believed equivalent to Springs Formation of Lewis (1946). Massive quartz sandstones often micaceous with a rather constant basal conglomeratic grit.

It is apparent that unless a very well developed sequence of Trias is found in any one place, including the various fossiliferous shale horizons, it is sometimes difficult to distinguish its uniform sandstone formations from one another on the basis of lithology alone, although the felspathic horizons are distinctive.

Within the area of this survey, there are a number of small isolated patches of sandstones which may be classified as Trias, but a thick sequence is found only in the south-east, in the beds which overlie Permian rocks outcropping south of

Hermitage and Dungrove and along the Lower Shannon. Here, in a line running from Hermitage to Dungrove to Cluny Park, a massive quartzitic grit horizon initiates a sequence of about 300 feet of sandstones locally intercalated by sandy shales and further grit horizons. The sandstones are mainly quartzitic and are generally cross-bedded. Measurements indicate that the sediment probably came from the west or north-west.

Along the road half-a-mile north-west of Hermitage, it appears that the same grit rests on the Permian marine sequence, and associated with the cross-bedding in the overlying sandstones there are some excellent examples of subaqueous pene-contemporaneous slumping over a band about one to two feet in thickness. The direction of this slumping also indicates a slope from the north-west. It is overlain by sandstones of similar character so there is no question of any external pushing force (such as glaciers) and it is explained as gravity slides on the sea floor under conditions of rapid accumulation with resultant overloading (see Fairbridge, 1946, 1947). The top of this sandstone sequence is transgressed by dolerites west of Hermitage, and even two miles south-west of Dungrove there is no indication of any passage into the chocolate or pink shales which are so widley exposed about ten miles to the south of here in the Hamilton region. This formation, therefore, we correlate provisionally with the Ross Sandstone of the Hobart region.

As mentioned above, there are numerous other small outcrops of sandstones in the present map area. Many of these are simply small inclusions in the intruding dolerites, representing a variety of xenoliths and roof pendants. In places, thin bands are intercalated between thick sills of dolerite. This is particularly so to the west of Dungrove and Southern Field (south of Hermitage) and along the valley of the River Shannon towards its junction with the Ouse. On the northern bank of the Shannon here, about one mile above its junction, there is a small outcrop of flat-lying micaceous sandy shales with flecks of graphite.

Additional small patches of sandstones, presumable Trias, occur at Jean Banks Farm and in several places on either side of the River Ouse about two miles south and south-east of Waddamana. A continuous belt of sandstones is found along the eastern border of Lake Echo and is up to 200 feet in thickness. In the north these sandstones are yellow to pink and felspathic in character, while in the south, near Echo Lodge, they are more quartzitic and have a sparkling character. This sparkling look Prider has shown is due to the euhedral character of the secondary quartz crystallised around the original rounded sand grains, and it is characteristic of the Ross sandstones.

The felspathic sandstones reappear about three miles south of Echo Lodge at Glenmark Farm, while about four miles to the south-west, along Seven Mile Creek, there is a development of sparkling quartzitic sandstones, about 200 feet in thickness. Here they are considerably broken up by both vertical and horizontal intrusions of dolerite. Patches of these sandstones are also found on the surface of the dolerite plateau west of Lake Echo and along the eastern side of Brown's Marsh Creek. In the south, sandstones appear below Victoria Valley beneath the dolerite and extend for a considerable distance up Boggy Marsh Rivulet and in patches up Bashan Plains Rivulet. They are all mainly of quartzitic character.

It is interesting that there are no intercalations of coal measures in our Trias such as are found elsewhere in Tasmania, but since these facies are generally associated with the middle or 'Felspathic Sandstone' beds and the main dolerite sill is generally found between this and the underlying Ross Sandstone (Lewis, 1933, etc.), its absence is hardly surprising, for the former sedimentary cover of the sill is almost entirely stripped off.

3. Jurassic

Following upon the sedimentation of the Trias, there seems to be a complete hiatus in the stratigraphic succession of Central Tasmania, until late Tertiary times. Igneous intrusives, however, in the form of dolerite sills, dykes, laccoliths and even lopoliths, are found intruding the Trias, Permian, and even older rocks. There is no direct evidence as to their age here, except that they must be Mesozoic, but closely analogous dolerites occur in the Karroo System of South Africa which are correlated by du Toit (1920, 1926) with the earliest Jurassic. The most recent and comprehensive study of these dolerites is by Edwards (1942), who made collections through these sills in different parts of Tasmania, showing that not only was the original magma completely uniform and liquid when intruded, but also that it underwent *in situ* differentiation in a remarkably uniform manner.

In the Central Plateau of Tasmania generally, one may readily confirm the observations of earlier authors as to the general characteristics of these intrusions. Here they are normally in the form of vast, more or less continuous sheets or sills, generally of the order of 1000 feet or more in thickness. This aspect may be seen to advantage at many points along the gorge of the Upper Ouse, which, in places, is cut down well over 1000 feet. The bulk of the area is occupied by the exposed surface of only one or two sills. Vertical dyke-like contacts occur in places, but not nearly to the extent found in the Midlands area to the east, where the sill form is less usual. Commonly in Central Tasmania, the intrusion comes up along a vertical (faulted) plane as a dyke, and at a certain horizon spreads out assymetrically to one side in an enormous sill, as noted elsewhere by Lewis (1927) and by Loftus Hills and Carey (1949). An excellent example is seen coming in along a north-south fault from Nelson's Bend down to the junction of the Ouse and Shannon, and spreading horizontally for many miles to the east.

Thinner sills may also be seen in certain places, particularly in the Permian sedimentary area north of Hunterston and just east of Hermitage church. These vary from only 10 to 20 feet in thickness. An equally narrow dyke may be observed cutting Permian mudstones, quarter-of-a-mile north of Brazendale on the banks of the Shannon.

Various authors have discussed in the past whether there were only horizontal and purely vertical contacts, or whether there were irregular and oblique transgressive contacts in places. Both varieties were found on this survey, but certainly the horizontal and rectangular contacts are most common.

Widespread occurrence of chilled margins has already been observed in the region by Nye, Lewis, Edwards, Prider, and others, and they are particularly useful in our area. Edwards (1942) notes that the base of the sill is often chilled to a thickness of 30 feet. Chilling of this order may be observed well along the east side of the Ouse at Waddamana, where dolerite rests on Permian sandy mudstones. The upper margin, as Edwards also observed, is naturally less often preserved, but in the broad plateau east of Waddamana and between Steppes and Interlaken there are numerous flat 'pavements' of very fine-grained dolerite, which are more often horizontally laminated than elsewhere (where vertical jointing is predominant). These 'pavements' are restricted to the higher levels of the plateau and I take them to represent nearly the surface of the intrusion. In places there is even a little baked shale preserved with it, e.g., about three miles north-east of Hunterston, or one mile east of Echo Lodge.

The dolerite sills may intrude Permo-Trias rocks at practically every horizon it appears, but a marked preference is shown for certain levels. At Waddamana it is in the middle of the Permian sequence, between the Marlborough and Woodbridge formations. In the sections between Victoria Valley, McGuire's Marsh,

Nelson's Bend, Hermitage and Dungrove, it is a Trias horizon (apparently the top of the Ross Sandstone, as found so often in the Midlands-Hobart region, see Nye, 1921; Lewis, 1933; and others). In the region east of Hunterston and Weasel Plains it appears to be obliquely transgressive, rising from the Permian up into the Trias southwards. A thin segment of Trias, a few hundred feet thick, is caught up between two thick sills of dolerite in the lower Shannon-Butler's Bridge area and again at Lake Echo and east of Brown's Marsh Creek.

The sediments were often tilted to 5, 10 or even 15 degrees during the intrusion, but rarely are they folded. As Lewis (1927) and others noted, there is no evidence of violence associated with these intrusions, apart from the tensional features.

Large xenoliths of sandstone and more rarely shale are often found caught up in the dolerite. They may be an indication of what the former 'roof' material of the sill consisted. Many are found around Victoria Valley, where they are up to 100 yards in lengths, lying at every angle. Here they are almost certainly Trias, since the sandstones of that age underly the sill here and thus presumably also overlay it originally. Another group of sandstone xenoliths occurs south-east of Waddamana, but since they are found in a sill resting on a sedimentary horizon fairly low in the Permian sequence, they may be from one of the mid-Permian sandstones of the type which are so widespread in the Hunterston region.

The sediments in contact with the chilled margins of the dolerite are somewhat metamorphosed, so that the sandstones become quartzites, while the shales and mudstones are 'baked' dark-grey to black, or converted to hornfels or chert. The degree of metamorphism is slight, surprisingly so in view of the statement by Edwards (1942), that the intrusion must have come in at a temperature of about 1000 degrees Centigrade. All authors, however, agree on this (Nye, Lewis, Edwards, Prider, etc.), but there is certainly more alteration at the upper contact than the lower. At the latter contact two-three feet may suffice to carry one down into unaltered sediment, but above I have seen 15-20 feet of baking and silicification; this is true even for some of the quite thin sills, e.g., the ten-foot sill, one-and-a-half miles north of Hunterston Homestead, has so hardened the *Fenestella* beds of the overlying Permian, that these normally rather soft and poorly preserved fossils are very easily collected.

4. Tertiary

As noted above, an extraordinary long phase of emergence followed the close of Trias sedimentation, and it was not until late Tertiary that traces are generally found of lacustrine sediments (see especially Johnston, 1888, 1921; Lewis, 1946). In the Waddamana map-area, probable Tertiary beds were found in only one spot, on the side of the Waddamana-Hermitage road near the head of Black Creek, half-a-mile north-west of Synnot's Sugar Loaf. They rest in a shallow depression in the Jurassic dolerite and amount to no more than ten feet of soft, unfossiliferous yellow-red sandy clays and gravel. The deposit is exposed over a distance of less than 20 yards and is overlain by basalt.

Basalt lava-flows are intimately associated with and overlie the late Tertiary sediments in other parts of Tasmania, and may be compared to some extent with the Newer Volcanic Series of the mainland (Edwards, 1939). Here they cover a fairly large area (56 out of the 391 square miles in the Waddamana map-area). Their existence was recorded in papers by Lewis (1933) and Edwards (1939) between Lake Echo and Waddamana in the Bashan Plains, and north-west of Steppes in St. Patrick's Plains, as well as east of the Dee basalts. These Dee

basalts cover some 12 square miles in the region of Duck Creek between the Dee and Victoria Valley. They form some small plateaux and mild rolling country ranging from 2600 down to 1800 feet.

The largest single area, however, is that of Bashan Plains, which extends from north of the region between Waddamana and Lake Echo to McGuire's Marsh near the junction of the Ouse and the Shannon, covering about 35 square miles. It drops gently in altitude from about 3100 feet in the north down to about 1500 feet in the south, the present gradient averaging about 100 feet per mile.

A third area of basalt lies south of Jean Banks between the Ouse and the Shannon, covering about nine square miles. Another small patch north-west of Steppes adjoins the much larger sheet on St. Patrick's Plains, lying mostly north of this map-area. A thin skin of basalt is found in places reaching south of here down the valley of the Shannon.

The basalt occurs in more or less flat, successive flows, each 30-50 feet in thickness and in places up to a dozen or more in number. Owing to differential erosion, these flows weather into a step-like terraced landscape, which often shows up clearly on air photographs as well as on the ground. The basalt quite clearly flowed down over a fairly dissected landscape, for the most part only part-filling the valleys, and only locally crossing the interfluves (see discussion, in Edwards, 1939). Local thicknesses are thus very variable but range to about 600 feet. Prider (1948) found similar thickness in the Tarraleah area. The lava must have been mostly very fluid, for it appears to have travelled down in single flows over the country for distances of 15 miles and more (e.g., in the Bashan Plains lava field).

No craters or vents were located in this area, but the flows appear to have originated in the north and flowed down a pre-existing slope to the south. As noted above there is generally a gradient of about 1 : 100 from north to south to-day, but how much this is due to an initial gradient and how much to subsequent warping is difficult to say; the question is discussed further below.

The basalts are somewhat variable in texture from top to bottom of each flow. At the base they are generally chilled and fine-grained, towards the middle medium-grained, often porphyritic, and towards the top generally filled with gas bubbles and even scoriaceous. These vesciles are sometimes filled by minerals of the zeolite class. The jointing in this area is not well exposed, but when seen it is generally irregular and not columnar.

Petrographically, the basalts belong to the olivine-basalt type. The olivine occurs generally in small phenocrysts against an almost black fine-grained ground mass.

The more precise dating of some of these late Tertiary basalts is indicated in areas outside our own (overlying Miocene lake deposits in the Derwent and Esk basins), which evidence suggests perhaps a Pliocene age. Edwards (1939), however, on physiographic evidence suggests they may well be late Pliocene or even Pleistocene. Lewis (1945*a*) concluded that there was in all probability several phases of basalt eruption, and, in the lack of pronounced evidence of glaciated surfaces on the basalts at Great Lake and elsewhere, the youngest may well be mid-Pleistocene. It may be mentioned, however, that glacial action is not very much in evidence in any case in the Great Lake-Waddamana region, and its features have sometimes escaped notice. The basalt plains around Bashan, etc., appear to bear glacially sculptured valleys. Against this, Lewis states (1945*a*, p. 38) that the Tarraleah-Waddamana basalts are cut by late Miocene-early Pliocene uplifts. So far as I can see at Waddamana, there is no evidence for affixing such an age to the slight post-basalt faulting here: it may just as well be

a late Pliocene-Pleistocene uplift. Prider (1948) has indicated that at Tarraleah he has post-Miocene basalt, probably Pliocene, but there is nothing to fix the age more precisely of the youngest faulting.

5. Quaternary

The general region of the Waddamana map-area is extraordinarily bare of soil, alluvium and other superficial deposits, except in the few areas of older sediments. The latter, of course, break down more readily than do the igneous rocks, which cover 70 per cent of the area. The reason for this absence of superficial cover is almost certainly to be correlated with the Pleistocene glaciation which affected Central and Western Tasmania. Lewis (1926) has remarked that some of this Central Plateau is a near 'desert' owing to the soil having been scraped off almost entirely by the ice-sheets. Insufficient time has elapsed since the glaciations to enable the break-down of the two extremely resistent igneous rock types to form new soil.

In the high plateaux of the Waddamana area, like those also to the north and west, there are, however, scattered depressions (mainly along old structurally controlled drainage lines) which are over-deepened, apparently by glacial scour, and these are practically all filled with Quaternary deposits. In places the depths appear to run up to about 200 feet, but generally they are much less. No deep borings have been carried out, and since these deposits are hardly cut into by the present drainage, they are not easily examined. In the Tarraleah area, however, Prider (1948) made a few post-hole bore tests. These proved that the deposits consisted mainly of glacial till. From the indications in our map-area, there must be similar boulder clays here, and in places there are white quartz sands and silt which suggest peri-glacial stream deposits. Glaciated boulders are small and for the most part infrequent.

The surface of these over-deepened glacial basins is now occupied by 'button-grass plains' and peaty swamps, though farmers have succeeded in draining the bulk of them. The bulk of the depressions have clearly recognisable rock floors and rims, and are not to be explained either by purely tectonic means or as boulder-clay dammed lake deposits.

It seems clear that these depressions contain all that is left of the pre-Quaternary soil cover of Central Tasmania. No trace of older lateritized or bauxitized soils *in situ* were found in this map-area, though they are clearly present in the lower, non-glaciated levels beyond the plateaux (Carey, 1947; and others).

Other relics of the ice-sheets are scarce in this map-area. No cirques, U-shaped valleys, roches moutonnées or drumlins were found, nor even striated surfaces. The evidence suggests rather, that if there was indeed an ice-sheet, as it seems, then it was thin and at least partly stagnant. Lewis (1933, p. 31) referring to this general area says: 'The ice-cap was never very thick; perhaps 100 feet was its maximum . . . and all the then existing hills and prominences protruded as nunataks of bare rock'. Certainly the tops of these hills to-day are strewn with scree, which suggests frost action on the well jointed dolerites.

It has been notoriously difficult to correlate the Tasmanian Quaternary glacial deposits with the world time-scale. It is clear that in places they are superimposed on the youngest basalt flows (see also Lewis, 1934), but in the present survey it has not even been possible to recognise any subdivision in the deposits. It appears to have been Lewis' opinion that our region was affected by the ice of his earliest, Malanna stage, which spread out in broad though relatively thin sheet over much

of the Central Plateau down to the level of about 2700 feet. In this way ice-lobes would have extended down from the north-west to Lake Echo-Waddamana-Lagoon of Islands (Lewis, 1933).

The topography, which we take to be glacially sculptured, extends however rather further south than this. They are found along the Seven Mile Creek, at Victoria Valley and in isolated cases between Waddamana and Hermitage. Great post-glacial erosion is recognised in the valley of the Ouse and elsewhere, on the south side of the Plateau, so that many of the old traces must certainly have disappeared. If our hypothesis regarding the marsh depressions is correct, however, then the lower limit of the ice in this region should be extended down to a little below 2000 feet.

Already in 1894, Montgomery claimed that ' the great lakes of Central Tasmania are almost *prima facie* evidence of glaciation ', but this may not hold good for Lake Echo, which appears to be primarily of structural origin. Lake Echo puzzled Lewis (1933) in that it lay rather to the south of his observed limits of glacial phenomena, but he imagined that beyond the dolerite rim it had been further dammed up by morainal material which is now obscured by vegetation in the valley of the Dee. Exploration here disclosed no evidence of this ' moraine ', the valley following structural lines in the dolerite (see further, Section V). Other swamp basins and lakes beyond his glacial limit (2700 feet) he ascribed to recent earth movements. Victoria Valley, Bashan Plains and the nearly-filled Lagoon of Islands he included here. All, however, have rock rims and appear to lack the necessary younger structural control (lack of air photos of Lagoon of Islands leaves this case still open). They all have smooth well-rounded contours and a plentiful sedimentary filling: the hypothesis of glacial over-deepening seems to be the most satisfactory of the present state of our knowledge.

Besides these Pleistocene glacial beds, there are very meagre superficial deposits in Central Tasmania. In our map-area the bulk of the streams are actively cutting down their beds, so there is very little alluvium. There are a few patches of recent silts along the bed of the River Ouse, notably where it crosses sediments, as at Waddamana, Nelson's Bend and McGuire's Marsh. Elsewhere along the Ouse and in all of the deeper valleys crossing the dolerite, the valley slopes are covered with masses of angular dolerite screes and the beds are choked with enormous dolerite boulders up to 20 feet or so in length. There is a broader expanse of alluvium, on the sediments again, at the junction of the Shannon with Hunterston Rivulet, and lower down there are patches at Brazendale and Hermitage. Similarly on Weasel Plains and around Cluny the sedimentary substratum gives rise to rich alluvium.

The presence of these broad alluvial tracts, high up along the upper courses of these Central Tasmanian streams, at heights of 1500 up to 2000 feet and more, cannot be explained by eustatic changes of sea-level down at the mouths, since they occur *above* bars and nick-points. Nor are they adequately explained as contemporary flood plains, for the rivers are in places well-encised in them, and settlements have been built on them well above flood level. Edwards (personal communication) has indicated that the recession of the bars or nick-points would adequately explain these features.

IV. Structure

The structural picture of the Central Plateau of Tasmania is at first sight perhaps rather simple, but in fact is more complex. The more or less horizontal superficial layers of Permian, Trias and intercalated Mesozoic dolerite, amounting

in places to several thousand feet in thickness, rest on a peneplaned basement of older Palaeozoic rocks which had folded and metamorphosed in the Devonian orogeny. Evidence for this phase is, however, outside the present area (see Lewis, 1945*a*; and Loftus Hills, 1922).

Since the Permian marine sediments are all of shallow-water character, in spite of their considerable thickness, a contemporaneous regional subsidence of proportional degree must be assumed. The freshwater character of the Trias suggests regional emergence, but it too possesses a notable thickness which implies relative subsidence between rising marginal blocks.

The next major diastrophic event was a broad warping accompanied by a complex block-faulting which took place at the same time as the dolerite intrusion. Individual fault-blocks thus became tilted to 10-15 degrees, and steeper dips are only found locally in connection with fault drags. Normally, however, the general attitude of the beds remained horizontal and unfolded. Evidence of this 'epi-Trias' faulting is found in many parts of the Midland province, Central Plateau and elsewhere in Tasmania (see Nye, 1921, 1922, 1924, etc,; Lewis, 1927, etc.; Edwards, 1942; Prider, 1948; and others).

With the cooling of the dolerite, a well-developed joint system developed, which is found to be remarkably uniform in character, conforming in some degree to the regional fault pattern. The two thus become difficult to distinguish, unless large displacements occur along the faults. Small displacements, leaving dolerite against dolerite, are hard to identify in the field from simple jointing where there is negligible displacement.

Some minor movements along these already-formed lines of weakness may have occurred subsequently as suggested by movements identified beyond our area. The general evidence here suggests, however, that during the long period from Jurassic to early Tertiary relative quiescence persisted, while the initially uneven, though not tremendously high, relief became gradually reduced by mid-Tertiary times (Lewis, 1945*a*). Lateritized and bauxitized surfaces of this old peneplain are found in a number of places in Tasmania.

Most observers agree that in about middle to late Tertiary and even Pleistocene times there recurred a period of block-faulting, dismembering the pre-Miocene peneplain. These new major displacements produced intense shearing in the dolerite, in places reducing it in a narrow zone to a greyish, puggy clay. In this way it is very easily eroded along these lines, and many of the important structural lines are followed by watercourses to-day. The actual contacts are not often seen in the field, but Prider (1948) has found them on the Nive and Lewis (1933) reports that during the excavation of the foundations of the hydro-electric dam on Great Lake at Miena, some quite wide bands of this vertically weathered dolerite were found. The presence of these weathered shear-zones suggests a movement that occurred long after the initial faulting which accompanied the intrusions. Basing his observations on the restricted area of the Midlands, Nye (1921, 1928, 1938, etc.) considered this post-dolerite faulting as subordinate in character, but on the basis of broader physiographic observations, Lewis (1927, 1933, 1945*a*) concluded that these younger movements were important and actually shaped the present-day relief; it seems that only in late Tertiary-Pleistocene times was the plateau elevated to its present height.

With these conclusions I entirely agree. There is no doubt whatever that the late Tertiary basalts flowed down over a well-dissected youthful surface which could only have been engendered by a recent elevation accompanied by further block faulting.

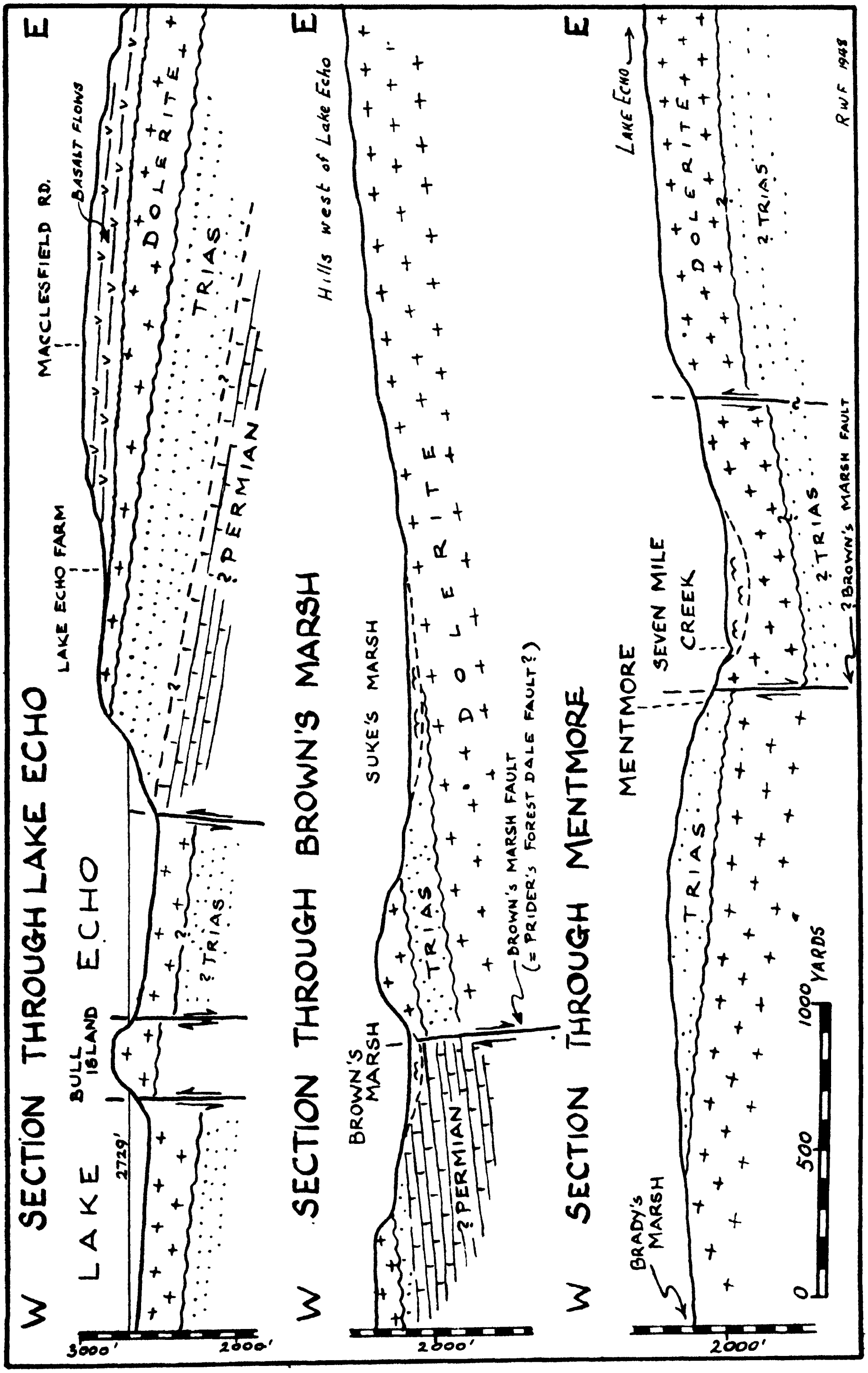

FIG 2.—Sections through Lake Echo, Brown's Marsh, and Mentmore.

The extrusion of the lavas themselves must have been the outcome of still more taphrogenic disruption, though its traces are not always apparent (Carey, 1947). In the Waddamana map-area the basalts appear to be cut off in a few places by fault-lines, so that if they are glaciated, as they seem to be, then at least in part they would be middle or late Pleistocene in age. Thus at least three distinct periods of displacement have occurred:

(a) Epi-Trias faulting (with dolerite intrusion), displacing—

(i) the peneplaned older Palaeozoic basement.

(ii) the Permian-Trias beds, also originally lying more or less in a horizontal attitude.

This older faulting to-day would not be expected to show physiographic expression (Lewis, 1945*a*, p. 32) unless re-exposed, possibly as fault-line scarps (e.g., Marlborough Fault, Prider, 1948).

The criteria for recognising this epi-Trias faulting are found in correlating across displacements the abovementioned datum-planes or the associated intrusives with true igneous contacts (Lewis, 1945*a*).

(b) Mid-Tertiary faulting, disrupting the Cretaceo-Tertiary Peneplain, but ante-dating the Miocene lake beds and Younger Basalts, which flowed out over youthful topography.

(c) Late-Tertiary to Pleistocene faulting. This disrupted the Miocene, but was associated with Younger Basalt extrusions, which may, according to the evidence of glaciation, have continued into the Pleistocene. Both this movement and the former are well expressed physiographically, but the former is more effaced by erosion and partly obscured by basalt flows.

The final structural pattern of intersecting faults separating a mosaic of jostled and displaced fault-blocks is thus a composite result left by these successive diastrophic phases. It is most probable that repeated movements occurred along old lines. Even the oldest faults are in part parallel to Older Palaeozoic or even pre-Cambrian lines (as noted by Loftus Hills, 1922; Carey, 1947; and others. It is frequently impossible, therefore, to define precisely the age of each fault-line.

Furthermore, owing to the abundance of parallel shears and joints associated with most of the important trends, we may often speak most accurately of 'fault-zones' without being able to define the loci of maximum displacement, sometimes to a width of a mile or so.

In rocks other than dolerite, minor fractures are much less common and are replaced by small warps and flexures. Again, owing to the uniform lithology of both Permian and Trias, just as in the big dolerite sills, even quite large displacements are not always indicated by a change in rock type across the fault.

Consideration of the tectonic patterns indicate thus:

1. Major Joint Pattern

With numerous exceptions, the main dolerite jointing is S.S.W.-N.N.E., W.S.W.-E.N.E. and N.W.-S.E.

2. S.S.W.-N.N.E. Fault Zones

With local deviations, there are about six major fault-zones across the area in a trend varying from N.5°E. to N.40°E. These are, from west to east:

(a) The Echo-Mentmore Zone, a belt of major faults, starting in the south-west near Mentmore, intersecting the south-western shores of Lake Echo, cutting off the two sides of Bull Island and bordering the eastern and western sides of Three Mile Marsh. The throws are partly east and partly west, resulting in a graben at Three Mile Marsh.

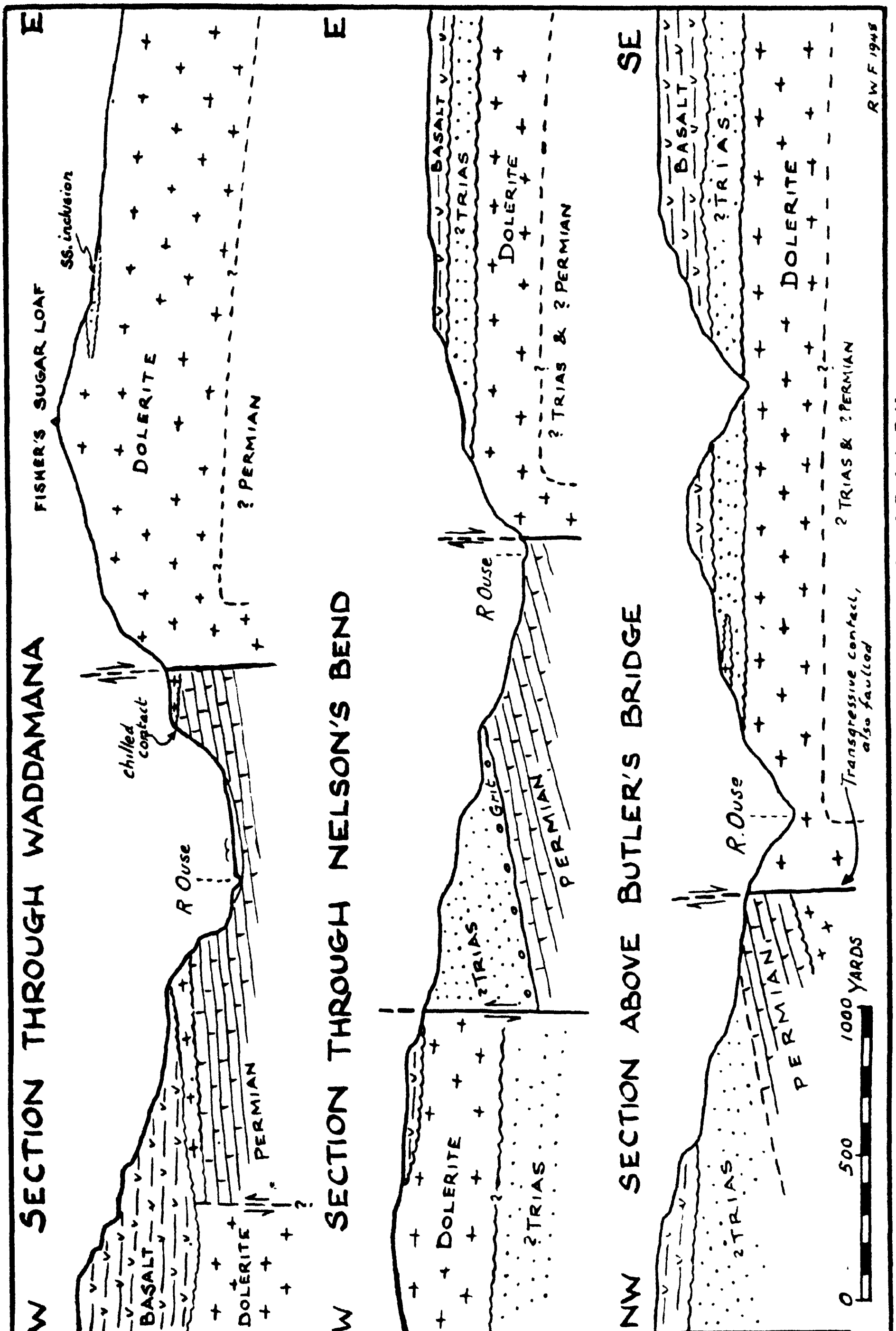

FIG 3 —Sections through Waddamana, Nelson's Bend, and Butler's Bridge.

Bull Island stands up as a narrow horst on the west side of this zone. The southern and eastern parts of Lake Echo are intersected by this zone (and others, see below) to form a complex 'Senkungsfeld'. Initial movements were probably epi-Trias and mid-Tertiary; latest movements in Pleistocene. Total displacements are probably of the order of a few hundred feet.

(b) *The Echo-Dee Zone*, a narrow zone, followed by the line of the Upper Dee and the eastern side of Lake Echo. Throw appears to be westerly. In the south it has little physiographic expression, although very clearly seen to be scoured out along the River Dee. It is partly responsible for the 2 to 300 foot drop along the east side of Lake Echo, and in this section Pleistocene (post-Basalt) movement is assumed, because broad sheets of basalt extend along the east side of the fault, but nowhere along the west side, which is up to 300 feet lower. Further north and south, however, where it shows no physiographic displacement, it would seem that no movement had occurred since the mid-Tertiary uplift. The total displacement in the centre may reach 500 feet.

(c) *The Victoria Valley-Waddamana Zone* is a broad belt of intense shattering and faulting in which the downthrow is to the west on the west side, and to the east on the east side. At Waddamana itself, the basalt appears to overlap the faults, which, although originating in the epi-Trias movements, seem to have controlled a pre-basalt drainage channel west of Waddamana, down which the basalt has flowed, thus displacing the River Ouse to the east. To the south, however, the basalt crosses to the south-east which suggests that the stream maintained itself across this structural zone during the mid-Tertiary uplift. Displacements would seem to range from 1000 to 1500 feet. Lewis (1933, p. 23) has recognised the direct continuation of this line to the north: 'A major fault appears to traverse the length of the Liffey Gorge and this probably runs southward via Half-Moon Marsh, across the site of the Great Lake and down the Shannon Valley, thence in the direction of the present pipe-line to the Ouse Valley in the vicinity of Waddamana.'. Traces of this trend were found during the excavations for the Miena Dam.

(d) *McGuire's Marsh-Nelson's Bend Zone* in the general way is restricted to a single clear-cut fault line, up which one of the major dolerite intrusions have come, spreading out asymetrically in a sill to the east. In this way, Permian on the west is clearly seen faulted against Trias and intrusive dolerite on the east. The dolerite has baked the Permian at the contact, so the age of the fault is essentially epi-Trias. The line continues for nearly ten miles along the course of the River Ouse, which is superimposed on it, cutting first down into one side and then down into the other regardless of rock hardness. Basalt is seen at rather similar heights on both sides of the valley, and it would seem to have undergone relatively little mid-Tertiary or younger movement. The northern extension of this line disappears beneath the basalt of Jean Banks, but it may control the course of the River Shannon south of its notable right angle bend west of Steppes. The displacement is of the order of 1000 to 1500 feet.

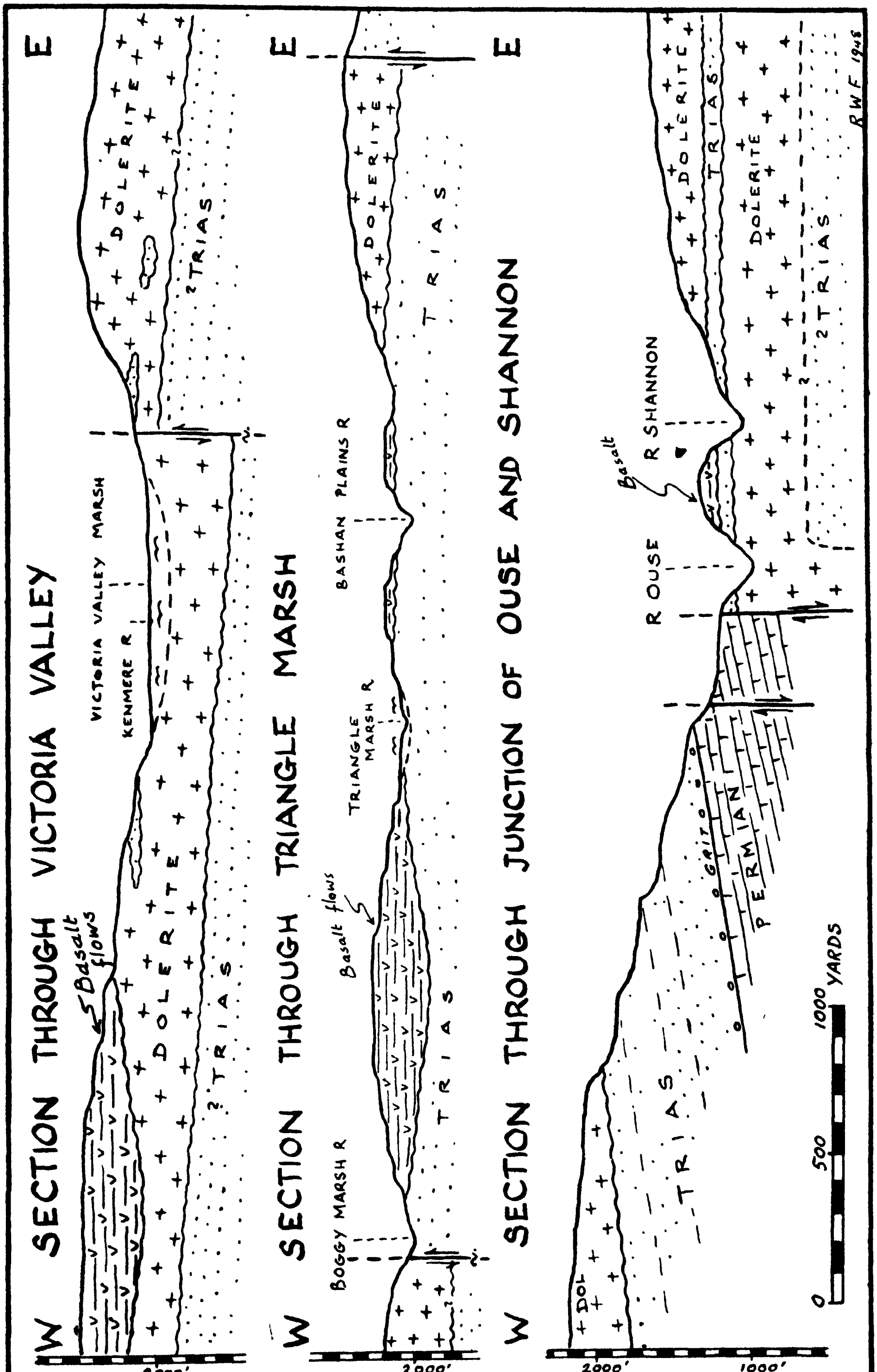

FIG. 4.—Sections through Victoria Valley, Triangle Marsh, and the junction of Ouse and Shannon.

(e) *The Lower Shannon-Steppes Zone.* This is a weakly developed set of lines, which appear to intersect the dolerite south of the Lower Shannon, to control part of the middle course of the Shannon and perhaps pass through Steppes to form the west boundary of the Lagoon of Islands.

(f) *The Cluny-Weasel Plains Zone* is a line which runs out of the east boundary of the map east of Cluny and Weasel Plains and follows the eastern borders of Hunterston and along the Upper Clyde towards Interlaken on the shores of Lake Sorell. It is probably of epi-Trias age for the most part, with an easterly throw and is marked by a fault-line scarp, east of the Hunterston-Cluny sedimentary areas, which, because of their elevation, have lost their dolerite sill capping and are now being eroded out into physiographic basins.

3. N.W.-S.E. and N.N.W.-S.S.E. Fault Zones

The north-westerly trends in this part of Tasmania are the most striking. Faults, shears and joints in this trend cross the map sheet in great sheafs. For this reason they are perhaps least easy to define. They are not so rectilinear as the meridianal to north-north-east trends, and often possess a slightly sigmoidal character, in the sense of a horizontal drag which would suggest a horizontal (transcurrent) movement to the south-east on the east-side (or north-west on the west); this matter will be discussed further below. The general dominance of these lines, may be explained perhaps by the essentially north-west and north-north-west trends in the underlying basement.

From west to east we may recognise:

(a) *The Brown's Marsh-Forest Dale Fault*, a rather exceptional feature, since it is almost definable as a single line. It is recognised north-west of our map-area by Prider (1948) as the Forest Dale Fault east of Marlborough where it appears to throw to the east, cutting off Permian with dolerite. It continues directly in line to the south-south-east with a displacement recognised along Brown's Marsh, where a sandstone of Permian appearance west of the line is brought against dolerite and a sandstone of Triassic type. Further south on this line, at Mentmore and along Seven Mile Creek, a Trias-type sandstone is introduced on the west side of the line against dolerite on the east, probably by cross-faulting. Recent drainage patterns are superimposed on this line, so that its age is probably epi-Trias. Its throw may be 1000 feet or more.

(b) *The Echo-Kenmere Zone* is, unlike the former, an ill-defined belt several miles in width, which crosses Lake Echo from the north-west and reappears along Kenmere Rivulet north of Victoria Valley. It is confused with the north-west to south-east joint patterns and a definite throw is not recognised. Across Lake Echo it appears to have a graben character, and possibly a westerly throw on Kenmere Rivulet. With its present physiographic rôle it may thus have played a part in Pleistocene upheavals, but its origin was probably mid-Tertiary or older. Throws do not appear to exceed a few hundred feet.

(c) *The Ouse-Hermitage Zone* is a pronounced sheaf of fractures along the upper course of the Ouse, crossing into the plateau behind Waddamana to the east and reappearing down the middle course of the Ouse nearly to Nelson's Bend, where it disappears beneath the Newer

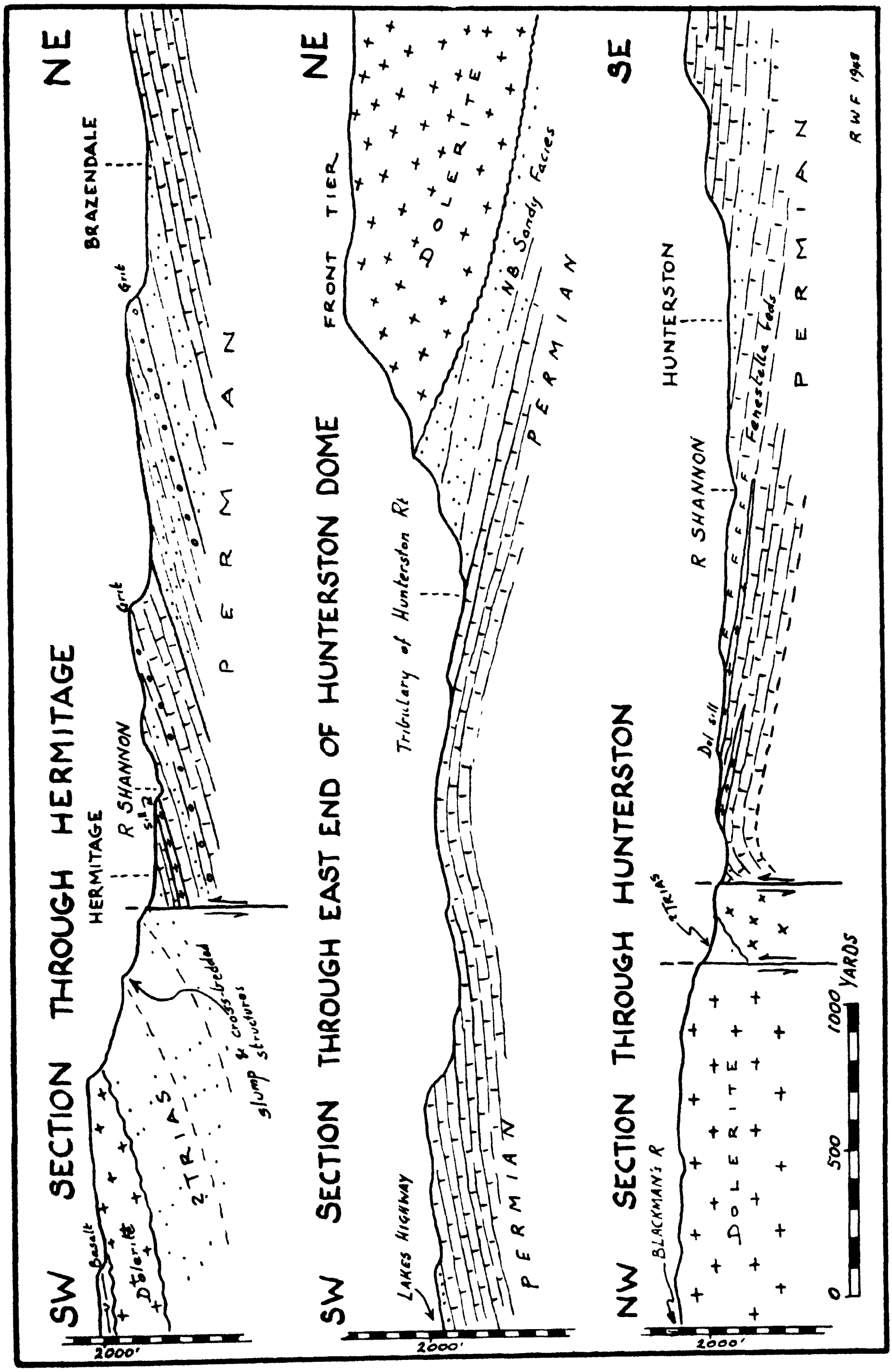

FIG. 5.—Sections through Hermitage and Hunterston.

Basalts in the direction of Hermitage. Between Hermitage, Southern Field and Cluny it seems to reappear in a convergence of various lines from north and north-west. The north-south lines cut off the west side of the Hunterston sedimentary basin and the north-west to south-east lines appear to dive beneath the basalt across the Shannon to reappear along the lower course of Bashan Plains Rivulet. All these faults appear to throw to the south-west. In this way the dolerite hills south of Dungrove (Green Hill, Ware's Sugar Loaf, etc.) are cut off on the south and to the north-west above Nelson's Bend, the west side of the Ouse Valley is generally somewhat lower than the east. In spite of all this physiographic expression, however, the zone is apparently older than the basalts, and probably had its main movements in mid-Tertiary. There is no evidence that it is older than this and none of the individual throws indicates a displacement of more than a few hundred feet. The occurrence of this fault zone along the Ouse Valley has been noted already by Lewis (1933).

4. Folding, Tilting and Regional Warping

As indicated already, there has been no true folding in Central Tasmania since Devonian times, and the general response of the Permo-Trias sediments to subsequent disturbances has been by means of block movements, with vertical displacements, maintaining a horizontal attitude, or with tilting *en bloc* to angles of 10 or at the most 15 degrees. Steeper dips are uncommon and almost invariably associated with fault drag.

An exception is met in the Hunterston-Weasel Plains area, one of the largest outcrops of sediments in Central Tasmania. Here a broad uplifted horst of sediments is surrounded on all sides by faults, throwing down dolerite and the upper parts of the Trias—a Hunterston Fault along the northern margin, a Weasel Plains Fault in the east, a Dungrove Fault in the south-west, and a Hermitage-Southern Field Fault in the west. This elevated block is tilted regionally to the south-west at an average angle of three degrees, but near the faulted margins dips up to 25-30 degrees are recorded. Along the northern and eastern sides there are two gently warped fold structures, giving rise to about one mile of easterly or north-easterly dips. The first is in the eastern part of the Hunterston basin and the second in the basin of Weasel Plains. They are partly separated by a number of small north-west to south-east faults.

These two dome-like structures are anomalous in the general picture of Central Tasmanian tectonics, but hints of intrusive activity are given north of Hunterston and around Weasel Plains by the presence of thin dolerite sills and dykes. It seems quite probable that these domes represent buried laccoliths.

Over the broader area of our map sheet, we may recognise similar areas of regional upwarp or depression, best seen when drawn on a section with an exaggerated vertical scale (x5). Sections drawn to natural scale would emphasise the gentle nature of these broad warps, but it would be difficult to apprehend when reduced to printed size.

Crossing the sheet on this section from east to west we recognise *(a)* the Hunterston elevated block, *(b)* the depressed block between the Shannon and the Ouse, *(c)* the elevated blocks west of the Ouse, rising steadily to Lake Echo, *(d)* the complex graben or senkungsfeld of Lake Echo, *(e)* the tilted block west of Lake Echo to Suke's Marsh, and *(f)* the raised block west of Brown's Marsh.

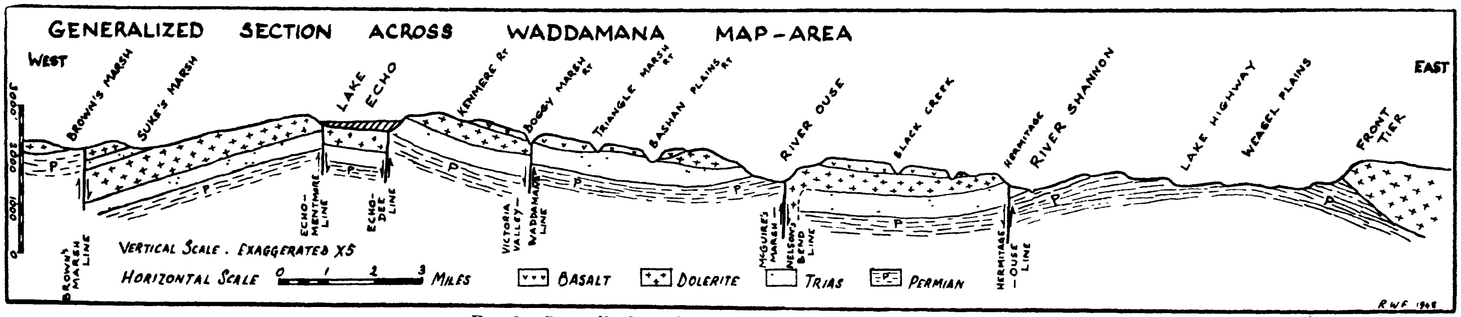

FIG. 6.—Generalised section across Waddamana map area.

Most of these blocks are slightly tilted, some one way and some another. In addition to their east-west tilt factors, most of the blocks are tilted to the south, so that there is a regional uplift towards the north, which averages 1000 feet higher than the southern sides of the blocks. The only exception is the Blue Hill block south of Hermitage and the Range, which has a northerly tilt, down towards the Shannon, rising just off this sheet to 1500 feet above its northern part.

The greatest regional elevations of the north, however, extend to the south in the line of Lake Echo, which stands as a lake-filled graben perched up on the top of one of the upwarps. It has the appearance in miniature of the classical faulted keystone of one of the high rift-valley lakes of Africa. It is the structural opposite from the up-arched horst of Hunterston.

V. Geomorphology

We have, in the Waddamana map sheet, an area where geomorphological considerations have played a major part in unravelling the geological history and structure. Much remains to be done, but some of the broad lines may now be recognised.

In the recognition of lithologic types, the associated land forms may be very helpful. Permian mudstones and sandstones weather in loamy soils of soft, rounded topography, but with cuestas on the hard bands and unmistakeable dip-slopes. Very rapid stream dissection in them produces vertical, blocky cliffs (as for example along parts of the Ouse near Waddamana and McGuire's Marsh, and of the Shannon near Hermitage). The Trias sandstones, and rare shales, weather in a similar manner, but whereas the mudstones are generally cleared for farming purposes, the less productive sandstones, and especially the coarse grit bands, are often left untouched or only partially cleared.

The dolerites weather in the valleys into light red bouldery clays, generally too heavily forested for much clearing; on the plateaux most of this soil is missing and an extremely rocky, though still fairly densely forested terrain exists. The topographic forms developed are essentially scarp and plateau lands, though most of the dolerite plateaux are tilted (to a few degrees only) from the true horizontal, and are found in places to pass along indistinct boundaries beneath other rocks (e.g., between Jean Banks and Hermitage, a southerly tilted dolerite plateau disappears beneath basalts along a quite irregular line). Elsewhere the junctions are mainly abrupt, steep scarps controlled by normal faulting.

The second type of igneous rock in the area, the olivine basalt, weathers into black to dark-red bouldery soils, which may be readily distinguished from those of the dolerite as a rule. Topographically it appears in terraced layers with flat plateau tops reflecting the original lava flows. The terrain is bouldery, though not with jagged rocks like the dolerite, but rather with smaller and more rounded boulders. The rock is fairly pervious and is generally drier, supporting less forest than the others, but furnishes a heavy growth of summer grasses and is thus much favoured by pastoralists. This terraced grassland is unmistakeable on air photographs.

The topography as seen to-day is generally controlled by dolerite sills which are broken up and tilted to form numerous disconnected high plateaux, but more locally by basalt flows which form terraced plateau lands. Again locally, either as 'windows' in the dolerite sills, or more rarely resting on them or sandwiched between them, there are inliers of Permo-Trias sediments which give rise to rounded topographic forms and valley tracts.

This topography is essentially mature in the high plateau lands, but is suffering progressive rejuvenation from the south. The major streams may be

seen to be steadily eating back headwards, developing deep clefts in the otherwise mature landscape of the north. In the southern part of the area very little is left of this old surface.

We have thus an immature landscape derived from an older mature landscape. Consideration of the drainage pattern, comparative elevations, the dates of the Pleistocene glaciation, the basalt eruptions and of the successive faulting, as seen in the preceding sections, forces the conclusion that we would expect not one peneplain, but traces of repeatedly revived landscapes, not all of which would have time to be reduced to the near-horizontality of peneplains. In simplest terms we might reasonably seek traces of:

(i) Late Mesozoic—Early Tertiary peneplain,
(ii) Late Tertiary, pre-basalt landscape,
(iii) Post-basalt, pre-glacial landscape,
(iv) Post-glacial landscape, but undissected by post-glacial drainage.

The first we should seek perhaps in the high plateaux, but there is no uniformity in levels here, in spite of claims to the contrary by Johnston, Lewis, and others. Such uniformity would naturally have been broken up by the mid-Tertiary and younger faulting. Relics of older lateritic and bauxitic surfaces are found outside this region (Carey, 1947; and others), but not so far in our map-area. The claim that the tilted surfaces of the plateaux represent the somewhat degraded pre-Miocene peneplain cannot be reconciled with the conclusion that the major faulting was epi-Trias. These tilted dolerite surfaces show a general parallelism in the cross-sections with the bases of the dolerite sills. It might be reasonable to conclude that, since these are infinitely the hardest rock-type in the area, they would be exposed in this manner by the normal processes of differential erosion. Furthermore, in several localities the traces of the chilled upper surface of these sills and even of the baked and contact-metamorphosed roof sediments have been discovered, coinciding with the surface of these tilted blocks. This interpretation is at variance with the one generally accepted so far, but has actually been suggested already by others (e.g., N. F. Giblin, in Nye's discussion, 1928, on Lewis' paper of 1927).

The recognition of stream courses to-day which are superimposed on epi-Trias structures supports Nye's statements (1921, 1928, 1938) that the present system had its inception immediately after the dolerite intrusions. The country was practically reduced to a peneplain (with possibly a few isolated monadnocks) by about mid-Tertiary times. Initially, no doubt, the streams were for the most part structually controlled; they would naturally be located in subsequent patterns down the tilted slopes and along the major fault zones of the epi-Trias disturbances. As this fault-scarp and dip-slope landscape gradually became reduced in relief, so the structure would progressively lose control of the drainage until, finally, peneplanation was achieved. In this way the streams flowing across the peneplain developed meandering courses, but subsequent regional elevation has caused some to be revived, cutting down and developing a superimposed character on the deeper pre-peneplain structures (e.g., along the Ouse between the Shannon junction and Nelson's Bend).

Lewis believed that all physiographic effects of this epi-Trias faulting would have been effaced by mid-Tertiary times, and, therefore, disagreed with Nye's contention about the great age of the drainage system. There was some truth in both ideas, as we shall see, but to some extent these two argued at cross-purposes. We have already concluded, however, that there was really no justification for assuming that the dolerite intrusion caused enormous regional uplifts, and in this we are agreed with Lewis' opinions (1927, 1945*a*, etc.) that the region remained

in a state of relatively low relief until after the mid-Tertiary. Later elevations, of course, make the younger drainage developments dominant.

We have seen how regional block-faulting and elevation occurred approximately in mid-Tertiary. Broad upwarps occurred right across the Central Plateau, tilting it to the south-east and south-west and appearing to leave the Midland valley more or less lagging behind (Lewis, 1927, 1933, 1945*a*). Clemes (1924) had already demonstrated three plateau levels, separated by step faults, between Lake St. Clair and Lake Echo, and there are in fact many more attributable to this phase. On this revived landscape an extensive subsequent stream pattern developed, in addition to the older streams which managed to maintain themselves in spite of the structural changes that lead to widespread capture and diversions. The older patterns, of course, became superimposed on the underlying older structures, but the newer streams reflected the new warps and faults. A youthful topography of considerable relief developed. Nye and Blake (1938) suggest that valleys over 1000 feet deep were able to develop before the Newer Basalts appeared.

In our own map-area the pre-basaltic landscape is well illustrated by the course of the basalt flows. The levels of these may be traced down old valley depressions from north-west to south-east. In places the floors of such valleys are found to be more than 300 feet below the dolerite hills on either side. We see that the largest flows in our area converge from Three Mile Marsh and Jean Banks on the Ouse Valley near the Shannon junction. We have already recognised that this section of the river was already in existence (though not as deep, of course, as to-day), and the basalt probably filled its broad meandering valley to a width of about four to six miles. It appears to have been joined here by an ancestral Boggy Marsh Creek on the west and by an ancestral Shannon on the east. These older streams were not coincident with the present, but lay respectively east and west of the present courses. As the basalt flowed down the old valleys it displaced the streams sideways, forming new lateral valleys. The lower part of the Ouse here, being in the centre, may have been blocked altogether, but this could not have been more than temporary, since the main stream has now reasserted itself along very much the same course as before. Higher up, between Waddamana and Bonaparte Creek, it seems that the basalt is thicker and lower about one mile to the west, and therefore the Ouse here may have been displaced to the east. Still higher, between Waddamana and Shannon, there appears to be the old course of the Ouse connecting with the headwaters of the present Shannon. Basalt-filled valleys here indicate displacement to the west, and it seems that the Ouse has captured considerable headwaters south-west of Great Lake, which formerly belonged to the Dee, while the former headwaters of the Ouse are now directed into the River Shannon.

For its part, the Shannon appears to have risen formerly somewhere in the region of Arthur Lakes, to have flowed south through the Lagoon of Islands, Blackman's Rivulet and Black Creek. As we have seen, the Jean Banks basalt flows displaced the lower parts of this course to the east, into the Hunterston region. Meanwhile, a northern tributary from somewhere about St. Patrick's Plains (north-west of Steppes) became displaced to the west by the basalt and captured the headwaters of the old Ouse in the vicinity of Shannon. The course of the Lower Shannon marks, as do other lateral displacements, the junction between the basalts in the west and the non-basalt country in the east; its meanders are thus controlled by structure and relative rock hardness, in notable distinction to the superimposed character of the Lower Ouse.

Similar reconstructions may be visualised for the Dee basalts, where Kenmere Rivulet seems to have been forced to one side and to have beheaded the original valley of Duck Creek, which is now filled with basalt. This basalt area coincides

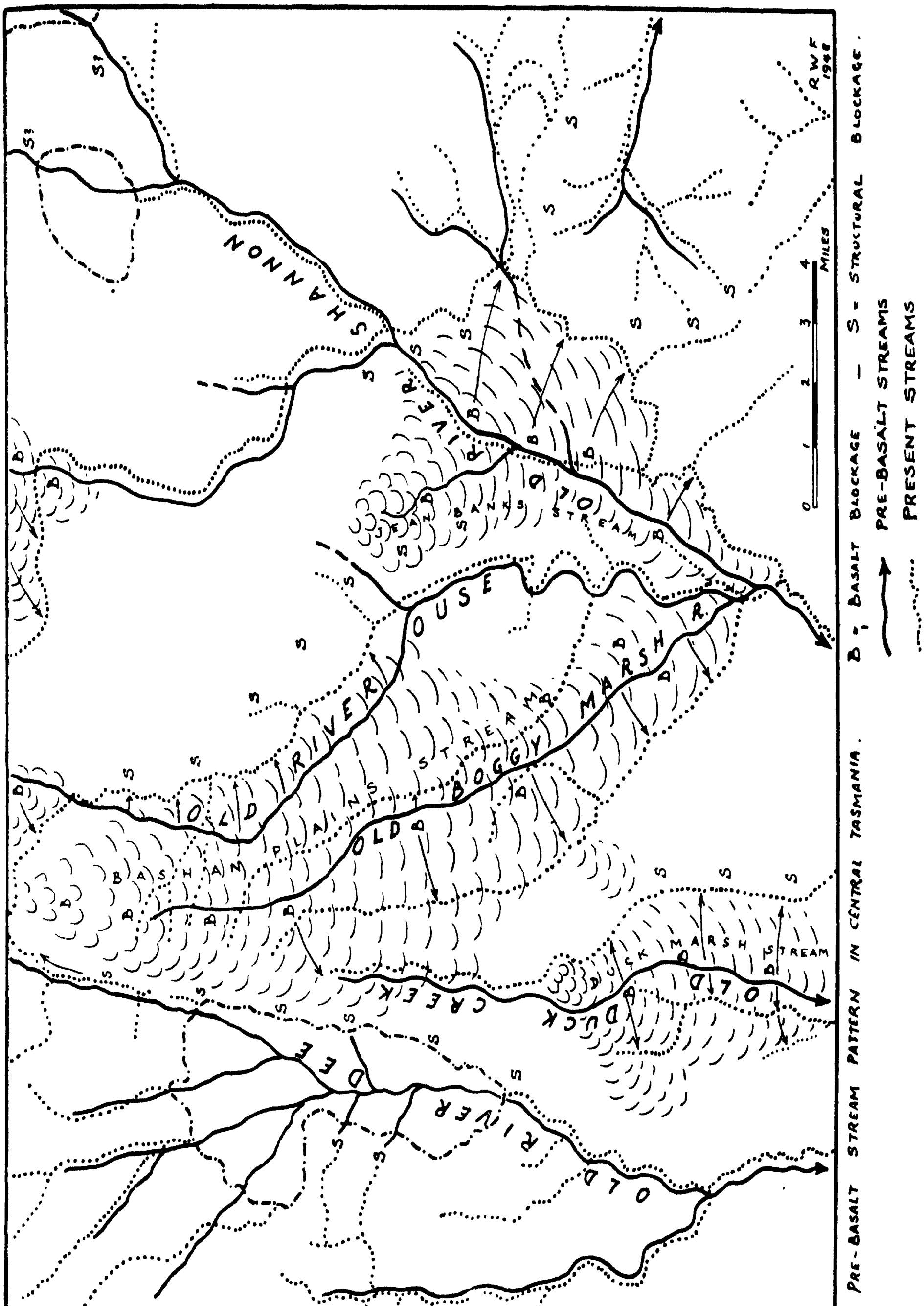

Fig. 7.—Pre-Basalt stream pattern in Central Tasmania.

broadly with the south-eastern (lower) part of our 'Echo-Kenmere' fault zone which is believed to have developed in mid-Tertiary times. Similar sagging may account for the St. Patrick's Plains and Upper Shannon basalts.

The Hunterston horst region became structurally and topographically high at this (pre-basalt) time, while its western edge formed the eastern limits of the Shannon. It became probably tilted to the west at this time and we now see the tributaries, such as Hunterston Rivulet, superimposed on the structures in the Permian sediments, crossing right over the dome east of Hunterston. In the same way Weasel Plains Creek cuts clean across the southern dome in the opposite direction; it certainly must be older that this mid-Tertiary westerly tilt and is clearly older in character than the post-basalt Lower Shannon. The gradual nature of the uplifts, permitting the maintenance of such superimposed patterns has been emphasised especially by Lewis (1927, etc.).

The basalts flowed down over a landscape of high relief which had been elevated most probably in mid-Tertiary times. The post-basalt landscape saw many displaced streams, paralleling the sides of the old valleys now occupied by volcanic flows, as well as captures and beheading (just as in Victoria, see Keble, 1918; Hills, 1940). In addition, it seems almost inevitable that the basalt extrusions must have been the outcome of further deep-seated block-faulting. Since these faults appear to be old lines of weakness revived, they are often difficult to recognise.

In our region, however, there is considerable geomorphological evidence of post-basalt disruption. Elsewhere, Lewis (1927, 1945*a*), Edwards (1939) and others, have noted post-basalt faults, and here at Lake Echo there is evidence of movement. There is no question of such lakes being primary depressions in the dolerite, as postulated by Johnston (1894). Structural observations indicate that Lake Echo is not to be explained solely by glacial erosion, as certain other authors have supposed (Montgomery, 1894); situated as it is near the outer limit of glaciation, its great area alone would render such erosion hardly probable. Nor is there any trace of damming by glacial moraines and boulder clays (supposed by Lewis, 1933) or again by basalts (as suggested by Edwards, 1939). The lake basin is interpreted as a complex 'senkungsfeld', in which the latest movement, especially along the middle part of the Dee-Echo-Three Mile Marsh Line, has possibly been post-basalt in age. The basalt is found extending to within half-a-mile of the lake shore on the plateau east of this line, but west of it, a block depressed at least 300 feet below the plateau, there is no trace of basalt. We may perhaps argue that had this broad depression existed before basalt times, it must have been filled by the lava. The fact that it is not, prompts the conclusion that it is a post-basalt feature.

The foundering of Lake Echo took place at the same time as the elevation and tilt of its marginal blocks. Practically no streams enter Lake Echo on the east; on the plateau here they all flow south and south-eastwards. The south-eastwards flowing streams which enter Lake Echo on the north-west follow structural lines, but may represent former tributaries of the Dee. The River Dee itself is superimposed, and partly antecedent too, along the southern extension of this old line of weakness (the Dee-Echo Line) and the streams in the same trend to the north-north-east along Three Mile Marsh may similarly represent its truncated headwaters. In this case the head of the Ouse probably also once flowed through this system into the Dee.

Regional uplift, however, of the whole of Central Tasmania, with local tilting of blocks, must also have occurred in post-basalt times, for, as Lewis has repeatedly emphasised, the large areas of mature topography still preserved at great elevation, would not have survived an unduly long attack by vigorous young streams.

According to Loftus Hills and Carey (1949), the basalt flows follow even thalwegs from over 3000 feet in Central Tasmania right down to below sea-level in the lower Derwent and Tamar. Substantially this concept appears to be correct, but they admit the possibility of post-basaltic movements, and our geomorphological and structural observations (especially at Lake Echo and north of Waddamana) indicate that slight interruptions of such thalwegs are to be expected. At Lake Echo the post-basalt displacement seems to be about 300 feet. Additional indications of faulting during or after the basalt eruptions are scarce in our area, except in the part three to five miles north-north-west of Waddamana, where smaller disturbances are seen.

The next event to exert further modifications to this Central Tasmanian landscape was, it seems, the Pleistocene glaciation, which, to some extent, it seems, overlapped the period of basalt eruptions. The precise age of the basalts is not fixed. Most authors regard the eruptions as continuing over some time. Both Lewis and Edwards accept most of them as Pliocene to early Pleistocene. Lewis (1945*a*) puts the Tarraleah and Waddamana basalts as Miocene, because they were cut 'by late Miocene-early Pliocene uplifts', an hypothesis for which he produced no evidence at all. Prider (1948) has subsequently demonstrated on fossil evidence that the Tarraleah basalt is post-Miocene. Lewis (1927, 1933, 1934) observed that some of the basalts are glaciated in places, as at Tarraleah and Waddamana, though denies that those at Great Lake are. The former he regarded as Miocene and the latter mid-Pleistocene. Edwards, however, considered them as all fairly young in this part of Tasmania; in fact, regarding most of them as young as mid-Pleistocene. Our own observations are that there is some evidence of glaciation on most of our basalt, though the thinness of the ice and the shortness of the period prevented it from very greatly modifying the landscape, apart from removing much of the soil cover, excavating local basins and gouging small valleys.

Most authors agree that even at their maximum extent the ice-sheets could never have covered more than about half of Tasmania (Montgomery, 1894; Lewis, 1945*b*; etc.). Even then it must have been very thin, for no isostatic compensatory elevation of Tasmania has been noticed in the post-glacial period (Lewis, 1927, 1945*b*). On the other hand, the late Pleistocene and Recent eustatic oscillations of sea-level appear to be faithfully recorded on the shore-lines and rivers of Tasmania (Lewis, 1935, 1945*b*; Edwards, 1941). Nevertheless, insufficient accurate levelling work has been done on this subject to be sure that minor isostatic warping has not taken place. Valleys of the main streams are widely terraced, but these features do not reach up as far as our map-areas, except for a most recent terrace which is probably due simply to normal recession of nick-points.

With the semi-mature post-basalt landscape elevated in places to over 2000 feet, there was also a sudden rejuvenation of all streams peripheral to the Central Plateau. Headward erosion took place on a tremendous scale. Rivers like the Ouse, already a composite of parts of the Lower Shannon and Upper Dee, cut down 1000 feet below the basalt level at Waddamana and further north appears to have captured extensive drainage areas.

The Lower Ouse, it seems, is definitely superimposed along an old epi-Trias structural line, over which it had meandered by the time of the break-up of the post-dolerite peneplain. It maintained itself during this mid-Tertiary elevation, only to have its valley blocked by basalt in late-Tertiary. Nevertheless, it appears to have subsequently re-excavated and further entrenched itself along the old line of weakness in post-basalt times.

To the north-east, vigorous erosion of one of the streams of the Western Tiers, according to Lewis (1933), the Lakes River, led to the capture of the

waters of Arthur Lakes and Wood's Lake ('Lake Leacock'), which originally flowed through the Lagoon of Islands and Blackman's Rivulet to the Shannon. As a result of this impoverishment the Shannon has remained for the most part unrevived, in remarkable contrast to its virile neighbour, the Ouse.

The River Dee, long since deprived of its main head-waters by the uplifts about Lake Echo, lost further to the Ouse when river capture took place in the vicinity of Three Mile Marsh, whose clearly southwards directed tributaries are sharply deflected north into the vigorously down-cut Ouse gorge.

Youthful, post-glacial erosion is now advancing steadily up from the southern limits of the plateau. It has not reached the hamlet of the Dee, but very nearly to Victoria Valley in the south-west. The whole of the central part of our area is involved in the rapid down-cutting of the Ouse, and headwards migration of nick-points is to be seen on Boggy Marsh Rivulet, Bashan Plains Rivulet and the Lower Shannon. Not mature section of the Ouse is seen at all in our area, which is in contrast to the Shannon above Hermitage and all its tributaries.

The old post-glacial surfaces are preserved almost intact across the north-eastern, northern and western parts of the map-sheet, except, of course, for the Ouse gorge. Even in the soft sediments of the Hunterston-Cluny area in the south-east there is negligible evidence of revival. Again, it is only in the south within the sphere of the Ouse down-cutting that very active erosion is progressing. Elsewhere we still have semi-mature landscapes, slightly modified by glacial action but much as they were at the close of basalt times.

VI. Discussion

The nature of the Mesozoic-Tertiary diastrophic evolution in Central Tasmania has been discussed before, notably by Lewis (1927, 1945*a*). His main thesis was that deep-seated earth movements of a regional folding character warped the deep crustal basement, resulting in superficial block-faulting dislocation in the relatively thin but brittle surface cover of Permo-Trias sediments and dolerite. With this explanation we may be in general accord, except in his attribution of the gentle basement warps to crustal shortening.

One of his main conclusions (1927, 1945*a*) was that there must have been a period when the country was repeatedly squeezed from the east and south-east against a resistent western buttress or an opposite pressure from the west; this period lasted on and off from Cretaceous to Quaternary. This concept is not altogether in accord with contemporary geotectonic ideas: no large-scale compressive folding or overthrusting is known in this region since the middle-Palaeozoic orogenic phases. The character of the normal block-faulting, associated with warping, fissure volcanics and hypabyssal igneous rocks, quite clearly indicates tensional strains coupled with vertical crustal movements. These points were already made clear by Nye (1921). As Lewis himself often noted, the eruptions and intrusions were not of the violent type; they were not 'squeezed out', however, but rose up on release of pressure along tensional fissures.

We would rather describe the post-Palaeozoic movements as typically epeirogenic, of a type which Stille would call 'undatory' in character; though both broader and more local oscillations are apparent, in dimensions the chief warps would fall into the class of van Bemmelen's 'meso-undations' (1936). By this we mean deep-seated warps of medium size, generally attributed to sub-crustal streaming or convection currents.

An expression of these slow undatory warps, the region has been affected by intense fracturing. In contrast to the slow initial (mainly epeirogenic) movements

during Permian and Trias, these episodes of fracturing (taphrogenic phases*) were, it appears, sharp and relatively short, separated by long periods of quiescence.

Broad radius, *vertical* movements are recognised throughout the Eastern Australian Caledonian-Hercynian orogenic belt from Mesozoic through to late Tertiary times, but it is chiefly in Tasmania that the crust is 'fortified' to some degree of rigidity by the presence of the dolerite sills. Thus the reaction to these vertical movements has been in the form of brittle fractures and tilting of fault blocks, unaccompanied, except quite locally, by the usual asymetric folds and monoclines so characteristic of the softer, more ductile cover rocks of the mainland. Striking contrast may thus be seen between the clear, sharp-edged, normal faults of the Tasmanian Permo-Trias-dolerite country and the drag-folded faults and monoclines (overlying basement faults) of the South-eastern Queensland Permian and Trias (see Fairbridge, 1948).

In superficial structures resulting from such deep-seated diastrophic forces, much depends therefore on the thickness and character of the overlying rocks: a thick blanket of soft ductile sediments will react very differently indeed to a relatively thin but brittle crust. One has only to refer to the classical works of Stille in the Saxonian belt of North Germany. Nye (1928) made this point when comparing the tectonics of the Midlands with that of the Central Plateau.

Stille (1943) has re-emphasised that the tectonic evolution of any sedimentary belt takes the following sequence: (i) Initial, embryonic undatory (epeirogenic) warping, with basin and ridge development; (ii) main undulatory (orogenic) folding, with horizontal compression; and (iii) post-orogenic or posthumous undatory warping. Tasmania experienced stage (ii) in the Devonian already, and since then has been involved in both general and local undatory (up and down) movements (stage iii). Stille makes a special point that in this post-orogenic stage, the first tendency is towards a general negative undation (downwarp, i.e., in Permo-Triassic-Jurassic times), followed by a general postive movement (upwarp, i.e., in mid and late Tertiary times) irrespective of the various local undations, which are superimposed on the major warps.

The igneous activity normally associated with such epeirogeny and taphrogeny in a maturing continental region (or 'Kraton' of Stille and Kober) is of well-recognised and definite character. First came the Permian downwarping, culminating at the close of Triassic and beginning of Jurassic times with deep-seated tension and block-faulting, accompanied by quiet hypabyssal intrusion of vast dolerite sills and dykes, in places of laccolithic and even lopolithic nature.

After the elapse of nearly two hundred million years in apparently almost complete quiescence, in mid-Tertiary times further block-faulting ensued, only to be revived once more towards the end of the Tertiary (with elevation and the extensive basalt eruptions of Central and South-east Tasmania).

Like the Newer Basalts of Victoria, these essentially olivine basalts of Tasmania are not the type of the Pacific province, but are intermediate to the tholeiites (according to a personal communication from Dr. Edwards). It is thus likewise incorrect to compare them, with Tyrrell (1937), to the 'Flood Basalts' (Geikie's 'Plateau Basalts').

As Edwards (1938) also remarked, in connection with the Victorian examples, it is significant that the region has suffered no major orogeny since the Devonian, and there is thus a notable absence of the geosynclinal and orogenic type of lavas. The region in short is typically epeirogenic, or better kratogenic, to use Kober's

* This is the term Krenkel first used in his early work on the African rifting and was later broadened by Bucher (1933) and Picard (1939).

term, and exhibits the igneous rocks normally associated with an originally semi-rigid but later deeply fractured and stressed crust. This fracturing seems to have reached greater depths by Tertiary times, since the basalts are presumably more ' abyssal ' than the tholeiitic dolerites.

In view of the apparently shallower origin of the dolerites, one might also look for some indications of volcanic eruptions which might represent the surface expression of the Mesozoic lopoliths. On the contrary, however, there is an apparent absence of Mesozoic eruptions, except for certain traces of tuff in the late Trias New Town Beds of Hobart (Lewis and Voisey, 1938), but an examination of the thickness of the sedimentary cover for each period may provide the explanation for this fact. The Mesozoic intrusions invaded a thick and more or less resilient mass of sediments ranging up to several thousands of feet in thickness, while the late Tertiary eruptives appeared in precisely the same region, which, far from having had the addition of any further sediments, had actually been exposed to continuous erosion throughout the odd 200 million years of the Jurassic-Cretaceous-Tertiary periods. Some thickening to the crust had been achieved by the intrusion of the dolerite sills, but these were now well fractured along vertical lines.

An additional reason for the absence of large-scaled Mesozoic extrusives may be sought in the nature of the epeirogenic and taphrogenic movements at the time. Just as Edwards had indicated in Victoria, there had also been a long period of down-sagging across the middle of Tasmania between the older, positive or stationary belts; during this period Permian and Trias shallow water marine and lacustrine sediments several thousands of feet thick had accumulated. It is hardly necessary, however, to postulate at the close of the Trias a sudden up-doming of this tectonically negative belt in order to provide space for dolerite lopoliths as did Nye, and others. On the contrary, Lewis (1927) argued that the elevation of Central Tasmania was post-doleritic. It would seem to be more in harmony with the evidence if the marginal blocks continued to rise, and, though the sagging belt between actually stood above sea-level, it continued to react tectonically as a down-warp. Thus, with the increasing load of sediments on the down-sagged belts, the Permian basement rocks were now less able to bend or stretch and started to fracture: rather like a ' green-stick ' fracture of a young bone, or like the fracture of a china plate (the Permian) covered by a layer of porridge (the Trias).

In the case of a down-warp, it is the basement which fractures first, whereas in an up-arched structure, compression may occur in the lower horizons, tension in the upper. For this reason I feel inclined to reject the suggestion (of Nye and earlier authors) that the Mesozoic dolerite intrusion accompanied an up-warp. I do not agree entirely with Edwards who wrote (personal communication) that he imagined ' a state akin to the early stage of a geosyncline in miniature ', referring to Bucher (1933, p. 478), a subsiding basin in which the lower horizons were fractured in a state of tension, while the soft, upper beds remained ductile. Tasmania during the Mesozoic should not, I feel, be compared with any stage of a geosyncline (see Stille, above): however, we agree entirely about the state of the intruded rocks: faulting in the hardened basement, with ductility in the overlying cover.

A similar situation exists in South Africa, where the Karroo dolerites exhibit close similarities to those of Central Tasmania, not only in their age, style of injection, etc., but also in that they intrude a continental basin sequence, the borders of which appear to have had a *positive* epeirogenic tendency throughout the periods in question. Du Toit (1920) correlated the injection with regional compressive and warping movements, discounting Schwarz' original idea of tension

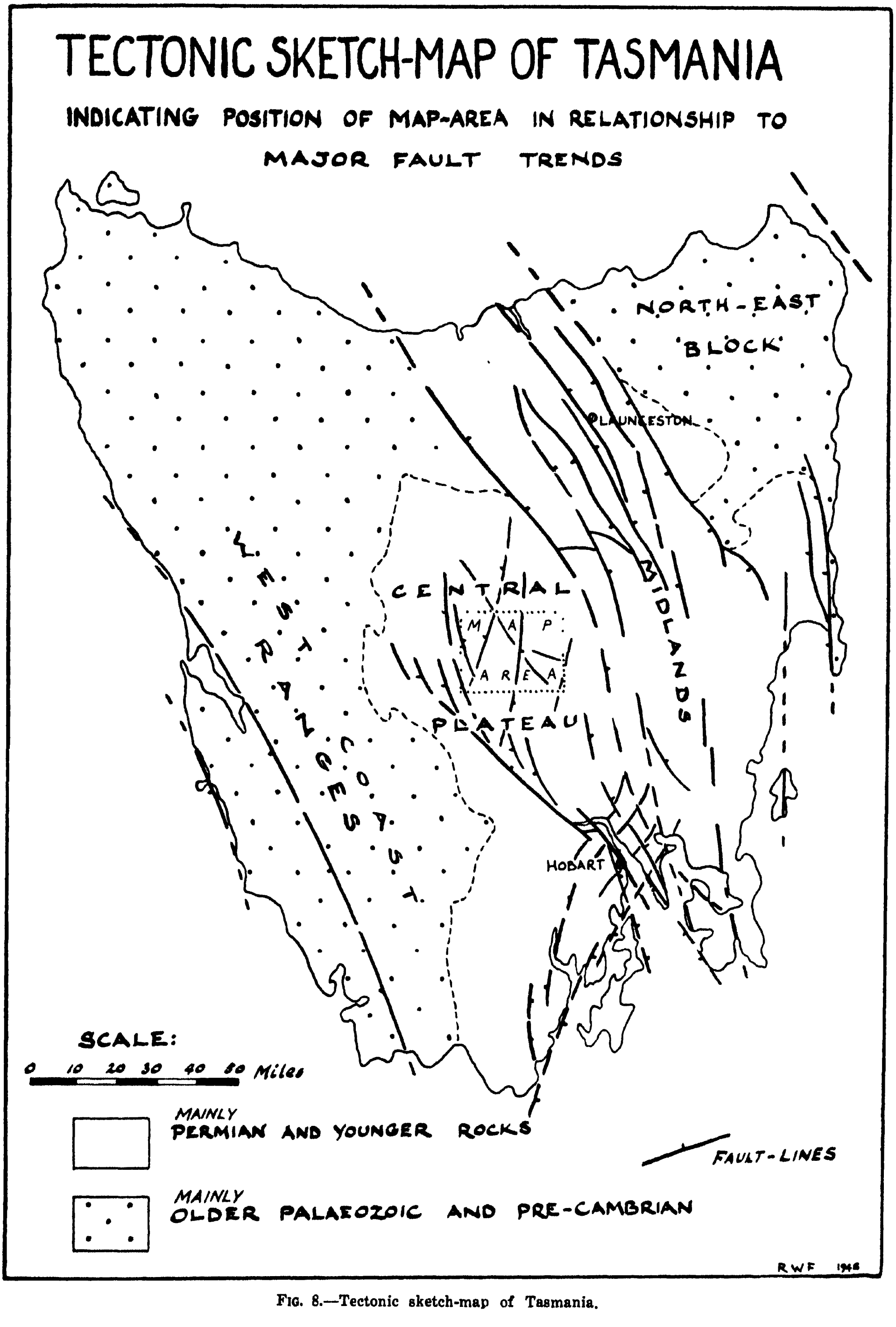

FIG. 8.—Tectonic sketch-map of Tasmania.

at the base of a subsiding trough. The deep-seated vertical fractures, especially in the older consolidated rocks are well-recognised, however, and the spreading out of sills at the junction of any sandstone and thick shale or clay member in the Karroo Beds is commonly found in many areas. Quite recently Jones and Pugh (1948) have confirmed how a wet, clayey horizon is specially effective in blocking the upwards movement of such injections.

It has been sometimes suggested that either, or both, the Mesozoic dolerite and the Tertiary basalt eruptions coincided with the events associated with the disruption of the old Gondwanaland continent, which appears to have existed prior to the Permian. This seems to be correct, for studies elsewhere in the Gondwanaland region also seem to indicate major taphrogenic phases at about the beginning of the Jurassic and towards the end of the Tertiary.

* * * * * *

Turning now to review the fracture pattern found in Central Tasmania, we have recognised first and foremost multitudinous sheafs of north-west to south-east lines crossing our map from end to end. They are best developed naturally in the brittle dolerite and tend to be absorbed in the soft sediments. In character they range from true faults and shears down to massive joint swarms. Their net effect is much the same: they appear to have been formed by series of broad north-west to south-east warps.

In addition to these gentle minor undation axes which trend north-west to south-east, there is a second set of major trends essentially of north-south to north-north-east to south-south-west orientation, which are more associated with major displacement than with warps. It is along these lines that major vertical dolerite intrusions are noted.

The complex, intersecting pattern of faults, shears and joints of the Central Plateau of Tasmania naturally calls for explanation beyond the circumscribed limits of our particular map-area. I have therefore sketched in the dominant patterns of faulting in the younger rocks of Tasmania on a tectonic map, in an endeavour to perceive the broader pattern. For clarity the map depicts only the younger tectonic patterns of the country, and omits the pre-Cambrian and Palaeozoic fault-fold trends.

It will be seen immediately that the younger rocks of Tasmania are crossed by a major series of north-west to south-east to north-north-west to south-south-east faults in a complex graben form which extends from Hobart through the Midlands to Launceston and the north coast. Between this shatter zone and the west coast there are many parallel lines. These major trends are intersected, however, by another series of faults which range from north-south to north-north-east to south-south-west; these are mainly subsidiary to the others but in eastern and south-eastern Tasmania they come to play a major role. In this manner the whole of Tasmania itself is triangular in shape and many of the plateaux and basins reflect this structural form.

It seems likely that, along these north to north-north-east trends, the faults break not only the superficial cover rocks, but also the semi-rigid, early Palaeozoic basement (Hills, 1922). The north-west to south-east trends, in Central Tasmania, on the other hand, we have seen are more in the character of fractured warps, and, although some are severely faulted, their habit is more flexural than that of the north-north-east lines. They parallel the older, pre-Cambrian fold-trends (see Twelvetrees, 1905; Waller, 1905; Carey, 1947). The resultant segmentation of the contrary into tilted and warped, diamond-shaped fault-blocks is thus of considerable complexity.

This pattern is not restricted to Tasmania, however. Lewis (1936) suggested that the major north-west to south-east lines of the Launceston-Midlands Graben, bounded on the east by the Ben Lomond Line and on the west by the Western Tiers Line, actually seem to cut clean across Bass Strait, to reappear in Victoria, again with intersecting north-east to south-west lines, as the boundaries of the Melbourne sunkland. Lewis showed how this rift conditions the presence of the Bassian Trough in the middle of the Strait, an area of subsidence completely enclosed by the 45 fathom contour and almost inexplicable by any but tectonic means.

The age of this depression has been also discussed by Nye and Blake (1938), who considered that the latest features were probably about early Miocene, though its original lines might go back to the Jurassic. One cannot agree with such an ancient date for the 'latest' features. Faulting is known to extend well into the Pleistocene (faulted basalts) and the basin depression of Bass Strait would have become blocked with sediment if it were anything but a very youthful feature.

VII. Summary

An area of the Central Plateau of Tasmania covering 391 square miles has now been mapped geologically for the first time, mainly by use of air photographs coupled with two months' field work. While the work can only be regarded as a preliminary reconnaissance, the broad results indicate that the geology consists of only one or two massive dolerite sills intrusive into the flat-lying Permo-Trias sediments, locally covered by Tertiary basalt flows. Block faulting took place during the dolerite intrusion and again in the Tertiary, before, during and after the basalt eruptions.

It is believed that the region suffered successive down-warpings in Permo-Triassic times culminating in the intrusion, through basement tension fractures, of dolerite in giant sills and even lopolithic structures. The relief was reduced during Mesozoic-early Tertiary times from one of moderate elevation to that of a peneplain, to be faulted and considerably elevated in several phases in mid and late Tertiary, even Pleistocene, during which basalts erupted and flowed down over an already well-dissected and youthful landscape. Streams are mainly superimposed in character.

The present landscape of tilted plateaux separated by fault-scarps is largely the result of differential weathering exposing the surfaces of the major sills, coupled with deep stream dissection owing to the considerable regional elevation (2000-3000 feet). Glaciation during the Pleistocene is believed to have carved out shallow depressions now occupied by boulder clay and marsh deposits, but otherwise little trace of it remains.

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PLATE V

FIG. 1.—Well-bedded, creamy white Permian mudstones, dipping 4° S.S.E., seen on W. bank of R. Ouse, 250 yds. W. of Waddamana Power Station. (Neg. RWF 3855.)

FIG. 2.—Platey cleavage in dolerite on important N.W.-S.E. shear zone, seen N.W. of Waddamana Power House on floor of R. Ouse. (Neg. RWF 3843.)

FIG. 3. Slumped structure in current bedded sandstone (probably Trias), ½ mile N.N.E. of Hermitage. Direction of currents and slumps is from N.W. to S.E. (Neg. RWF 3825.)

FIG. 4 Cross-bedding in quartzose sandstones (probably Trias), immediately below dolerite sill 2 miles S.W. of Dungrove Homestead. (Neg. RWF 3888.)

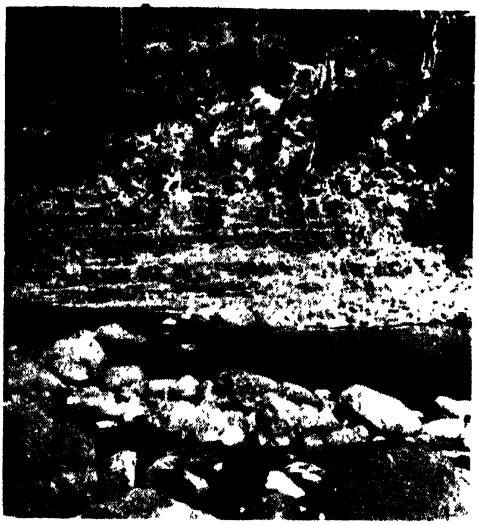


FIG. 1

FIG. 2

FIG. 3

FIG. 4

PLATE VI

FIG. 1.—Looking E. across Shannon Valley from 1 mile N. of Hermitage. Alternating Permian mudstones and gritty sandstones dip few degrees S.W. (Neg. RWF 3823.)

FIG. 2.—Looking S. from same spot as fig. 1 Permian mudstones and sandstones dip gently S.W., to be overlain in distance by probable Trias and in turn by overlying hilltops of dolerite (Dungrove Green Hill on left, Ware's Sugar Loaf on right). (Neg. RWF 3822.)

FIG. 3.—Nelson's Bend on R. Ouse, 8 miles S. of Waddamana. W.-dipping Permian mudstone and sandstone, overlain by probable Trias sandstone. (Neg. RWF 3854.)

FIG. 4.—Nelson's Bend, looking E., showing horizontal probable Trias sandstones, overlain by basalt, separated by faulting from Permian mudstone in bed of river and dolerite on right-hand side. (Neg. RWF 3852.)

FIG. 1

FIG. 2

FIG. 3

FIG. 4

PLATE VII

FIG. 1.—Looking from the hills W. of Waddamana across the Ouse Valley towards Fisher's Sugar Loaf, typical monadnock near faulted margin of dolerite country. (Neg. RWF 2826.)

FIG. 2.—From same spot as fig. 1, but looking S. down Ouse Valley and showing typical horizontal basalt lava flows resting on Permian mudstones (in the valley). (Neg. RWF 2827.)

FIG. 3.—Lake Echo, N.E. corner. From shore of probable Trias sandstone, looking N.W., past Bull Island to N. shore and dolerite plateau. (Neg. RWF 3861.)

FIG. 4.—Horizontally laminated dolerite, probably chilled top of 1000 foot thick sill, coinciding with flat top of plateau, 1 mile E. of Steppes. (Neg. RWF 3815.)

FIG. 1

FIG. 2

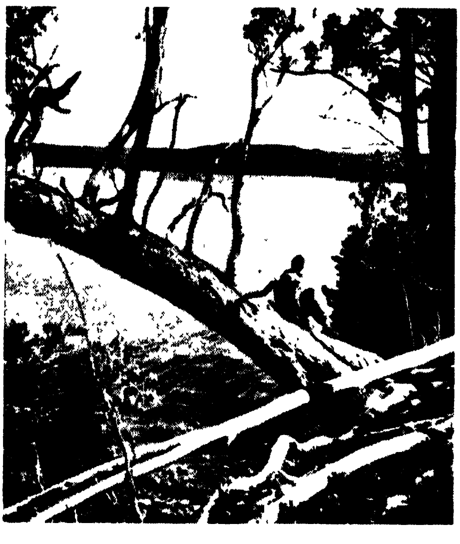


FIG. 3

FIG. 4

PLATE VIII

Oblique air photo, looking N E over Waddamana, showing pipe-line from Penstock Lagoon, down to Power House in Ouse Valley. Note almost flat dolerite plateau cut off by faulting and deeply incised along the line of the Ouse

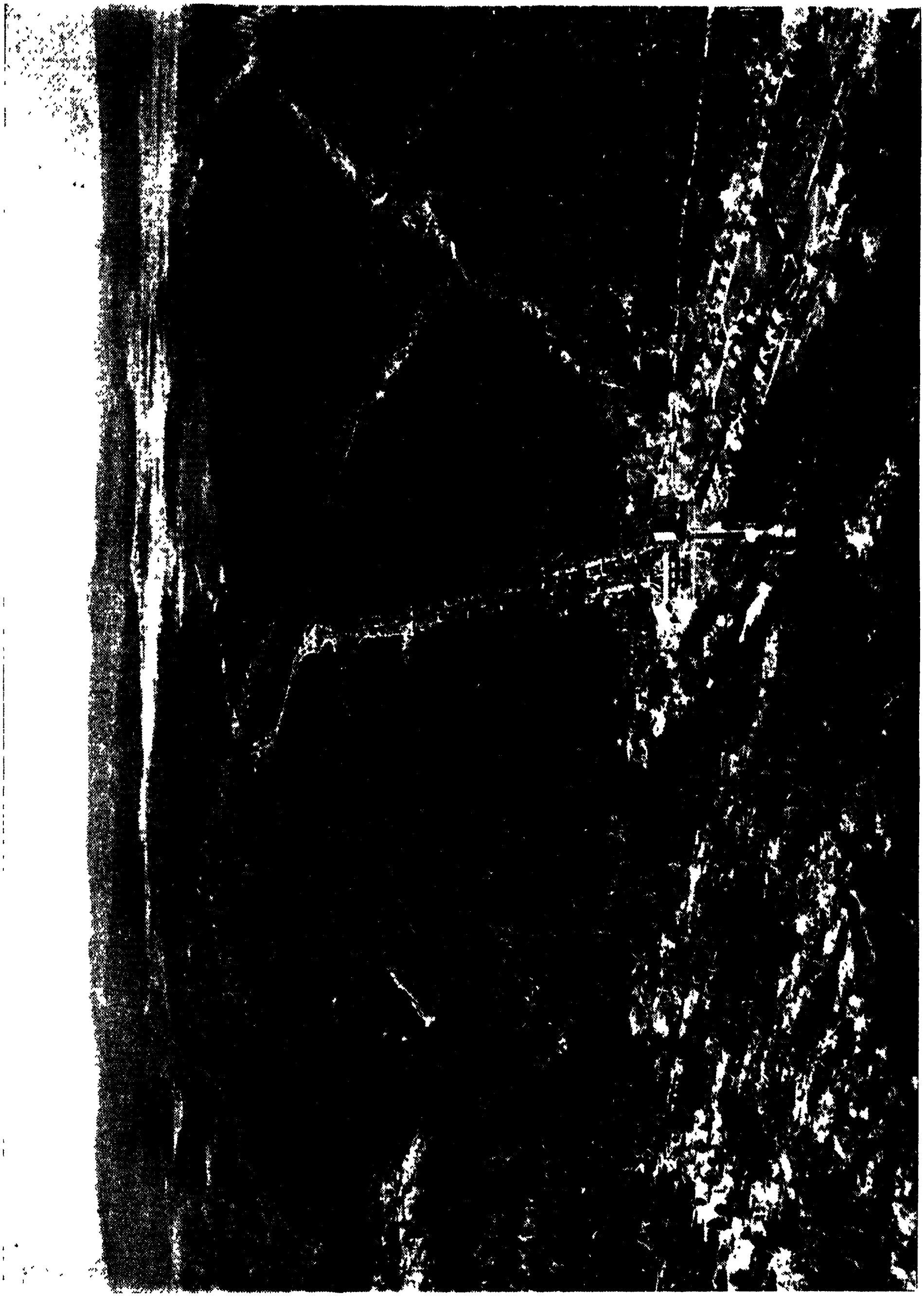
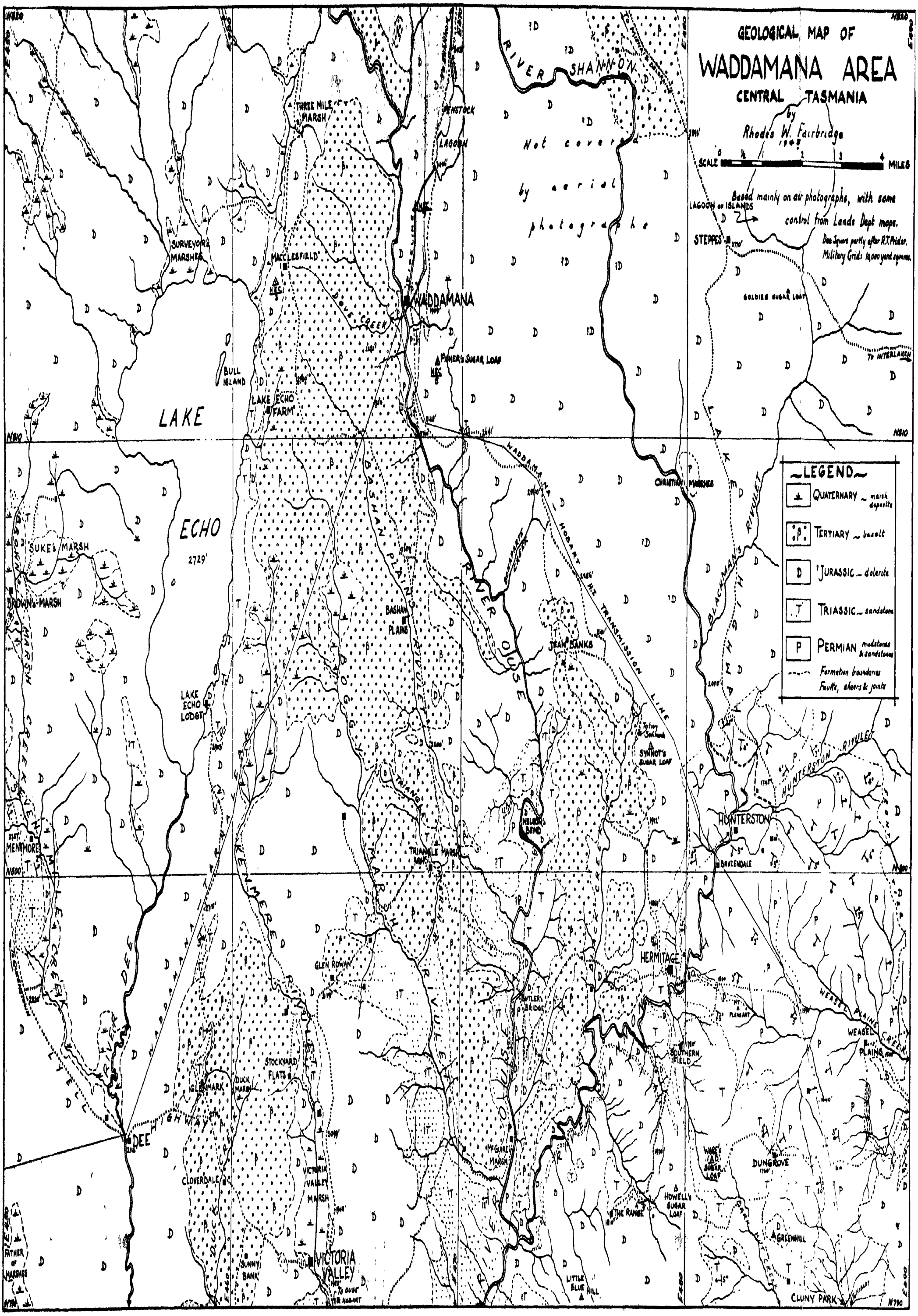


PLATE IX

Geological Map of Waddamana Area


GEOLOGICAL MAP OF
WADDAMANA AREA
CENTRAL TASMANIA
by
Rhodes W. Fairbridge
1948
SCALE 0 ½ 1 2 3 4 MILES
Based mainly on air photographs, with some control from Lands Dept maps.
Dee Square partly after R.T. Prider.
Military Grid: 10,000 yard squares.
Not covered by aerial photographs
LEGEND
QUATERNARY ~ marsh deposits
TERTIARY ~ basalt
?JURASSIC ~ dolerite
TRIASSIC ~ sandstone
PERMIAN mudstones & sandstones
Formation boundaries
Faults, shears & joints
WADDAMANA
LAKE ECHO
RIVER SHANNON
RIVER OUSE
DEE
HUNTERSTON
HERMITAGE
VICTORIA VALLEY
BOTHWELL

The Royal Society of Tasmania
1948

Patron:
His Majesty the King.

President:
His Excellency Admiral Sir Hugh Binney, K.C.B., D.S.O.

Vice-Presidents:
W. H. Hudspeth, B.A., 1948.
W. L. Crowther, D.S.O., M.B., F.R.A.C.P., 1948, 1949.

Council:
A. L. Meston, M.A., 1948, 1949, 1950.
J. W. C. Wyett, B.Sc., A.A.C.I., 1948, 1949, 1950.
S. W. Carey, D.Sc., 1948, 1949.
L. W. Miller, M.Agr.Sc., F.R.E.S., 1948, 1949.
V. V. Hickman, B.A., D.Sc., 1948.
J. L. Somerville, M.Sc., F.A.C.I., 1948.

Hon. Secretary and Librarian:
Joseph Pearson, D.Sc. (Manchester), D.Sc. (Liverpool), F.R.S.E., F.L.S.

Assistant Hon. Secretary:
D. Colbron Pearse, M.C.

Hon. Treasurer:
S. Angel.

Hon. Auditor:
H. J. Exley, M.A.

Hon. Editor of the Papers and Proceedings:
D. Colbron Pearse.

Standing Committee:
W. L. Crowther, S. W. Carey, W. H. Hudspeth, J. Pearson.

Annual Report, 1948

The Annual Meeting was held in the Society's Room, Tasmanian Museum and Art Gallery, on the 2nd March, 1948.

His Excellency the Governor, President of the Society, presided.

The following Office-bearers were elected:—

Vice-President: Under the Society's Rules, Mr. L. Cerutty retired from the office of Vice-President, and Dr. W. L. Crowther was appointed in his place (retiring 1950).

Hon. Secretary and Librarian: Dr. Joseph Pearson.

Hon. Assistant Secretary: Mr. D. Colbron Pearse.

Hon. Treasurer: Mr. S. Angel.

Hon. Auditor: Mr. H. J. Exley.

Council: There were two vacancies on the Council caused by the retirement (under Rule 21) of Dr. Crowther and Mr. Wyett. Dr. Crowther, having served for three years, was not eligible for re-election as a member of Council, but was eligible for election as Vice-President (Rule 21). Mr. Wyett, having served only one year, was eligible for re-election (Rule 21).

Only one nomination had been received, that of Mr. J. W. C. Wyett. Accordingly the President declared him duly elected.

The President then called for nominations to fill the second vacancy on the Council. Dr. Crowther proposed and Mr. Hudspeth seconded the name of Mr. A. L. Meston. As no further nominations were received the President declared Mr. Meston duly elected a member of the Council.

The names of the full Council for 1948 are given on the previous page.

The Council made the following appointments at its first meeting:—

Assistant Librarian: Miss H. Taylor.

Standing Committee: Dr. W. L. Crowther, Professor S. W. Carey, Mr. W. H. Hudspeth, and the Hon. Secretary.

The Council elected the following two members of the Society to serve on the Board of Trustees of the Tasmanian Museum and Botanical Gardens:—Mr. W. H. Hudspeth and Mr. F. H. Foster.

Meetings

Nine ordinary meetings and one special meeting were held during the year. Included in these was the R. M. Johnston Memorial Lecture, on Friday, April 30th, delivered by Professor Griffiths Taylor, Professor of Geography at the University of Toronto. The lecture was entitled 'Racial Migrants and Relations'. Professor Taylor was presented with the R. M. Johnston Medal. At this meeting opportunity was taken to bid farewell to the Hon. Secretary, Dr. Joseph Pearson, who had been granted leave of absence to visit England and the United States of America. A conversazione followed the lecture. About 300 persons attended.

The Royal Society of New South Wales asked the Council of the Royal Society of Tasmania to present the Walter Burfitt Prize and Medal for 1947 to Dr. J. C. Jaeger for outstanding contributions in the field of mathematics. This presentation was made to Dr. Jaeger at the meeting held on 1st June.

In addition to the lectures given at the ordinary meetings scientific papers were submitted for publication and have been printed in the present volume.

Library

During the year 1352 volumes were added to the Library in addition to a number of reports and pamphlets from British and foreign institutions and learned societies. The number of institutions on the Exchange List for the year was 297, and new exchanges were arranged with the following institutions:—Netherlands East Indies, Batavia; Museum für Volkerkunds, Leipzig Dom Bosco, Goinania, Brazil; Münchner Entomologische Gesellschaft, München; Italian Institute of Idrobiology; Mathematical Department of the Polytechnic Institute of Iassy.

The Library now consists of 23,518 volumes.

Cataloguing the Library

During the year Miss M. Griffiths, B.A., Cataloguer from the University of Tasmania's Library, has continued her work of cataloguing the Society's Library and classifying it under the Dewey System of Classification. As mentioned in the last report, this arrangement was made with the University on condition that in return for Miss Griffith's services, a duplicate author catalogue should be made available to the University Library.

Membership

The Society consists of the following members:—

Honorary members		2
Corresponding members		3
Ordinary members—		
Class A	204	
Class B	132	
	—	336
Life members		24
Associate members		31
		—
		396

During the year 23 names were removed from the List of Members owing to deaths, resignations, etc., and 88 new members were elected, eight of these being life members, 68 ordinary members, and 12 associate members. (Also two ordinary members became life members.)

Deaths

The Council regrets having to record the deaths of the following members during the year:—Miss D. H. Nicholas (1933), Mr. E. A. Elms (1942), Mr. L. A. Evans (1918), Mr. N. D. Ferguson (1944), Mr. G. Fitzpatrick (1943), Mr. E. L. Hall (1924), Mr. W. C. Kent (1946), Mr. W. R. Rolph (1921), Mr. P. B. C. Walch (1918).

Alteration of Rules

A special meeting of the Society was called on 5th August, 1948, in order to consider an alteration to Rule 43 regarding the fee for life membership. Previous to this the fee had been £15, but at this meeting this rule was amended by deleting the word £15 in one line and inserting the word £20 in lieu thereof.

Assistant Librarian

In December Miss Helen Taylor, who had held office as Assistant Librarian for some years, resigned to be married. The Council would like to record its appreciation of Miss Taylor's services in the Library. Her place has been taken by Miss Barbara Veale.

Financial Position of the Society

In the report for 1947 the Council stated that representations had been made to the Hon. Premier for financial assistance to the Society and a conference on this matter had been held when the Society's needs were made known. This resulted in an increase from £200 to £300 in the Government grant for printing that year. When the Budget for 1948 was prepared a deputation waited on the Chief Secretary and asked that financial assistance to the amount of £750 be given to the funds of the Society so that there would be provision for adequate salaries and for the purchase of books, etc. The Society's request was referred to the Premier and Cabinet and on 27th May a letter was received from the Chief Secretary in which he stated it had been decided that financial assistance for clerical staff could not be approved, but the amount already on the Estimates for publications would be increased by £200 per annum, making a total of £400.

Memorial Funds

In conformity with the agreement made concerning the A. N. Lewis Memorial Fund a further £50 was withdrawn from the Hobart Savings Bank and invested in the Commonwealth Loan. This makes a total of £250 invested. Books to the value of £6 19s. 10d. were purchased for the Library from this fund.

Also books were purchased for the Library from the various funds as follows:—

	£	s.	d.
R. M. Johnston	9	10	0
Morton Allport Memorial	7	14	0
Clive Lord Memorial	7	4	11
A. H. Clarke Bequest	6	19	0
Milligan Bequest	6	2	2

Knopwood Diaries

The Council wishes to record its appreciation of the Government's action in presenting to the Society a complete set of enlarged photographic prints of microfilms of Knopwood Diaries in the possession of the Mitchell Library. These photographic prints have been bound and placed in the Library.

Collection and Preservation of Historical Records

The Society is sponsoring a move which has been made to trace and record valuable historical documents (old diaries, etc.) which may be in private hands, with a view to their preservation. The scheme will embrace the whole State. Also it has urged the appointment by the Government of an archivist.

Gifts to the Society

The following is a list of gifts to the Society during the year, in addition to the numerous exchanges received from British and foreign institutions:—

Scott Polar Research Institute, Cambridge, England: The following documents which formed part of the Lefroy Bequest:—

I. Address to Sir John Franklin on his appointment to the governorship of Van Diemen's Land, signed by citizens of Westbury and Launceston.

Address to Sir John Franklin on his resignation of the governorship of Van Diemen's Land, signed by the landholders, magistrates, and others of the northern part of the island.

II. Resolution of sympathy with Lady Franklin by the Legislative Council of Van Diemen's Land, 1852.

Address to Lady Franklin from the Tasmanian subscribers to her private search expedition, 1852, with an analysis of the list and details of the sums contributed.

III. Resolution in the Tasmanian House of Assembly of thanks to Lady Franklin for her gift of Franklin Island, 1868.

A Short History of Latrobe—Centenary of Christchurch, Cullenswood—A Short History of Cressy and Bishopsbourne—Longford, past and present—White Hills and Franklin Village, by K. R. von Stieglitz, presented by the author.

'The Platypus' by Charles Barrett, presented by Miss A. G. Adams.

The Tasman map of 1644, Historical note and description of MS., presented by the Mitchell Library, N.S.W.

THE ROYAL SOCIETY OF TASMANIA.

Statement of Receipts and Payments for Year ended 31st December, 1948.

RECEIPTS.

	£	s.	d.	£	s.	d.
Subscriptions—						
A—191	286	10	0			
B—133	139	12	6			
Associate (23)	11	10	0			
Plus Exchange	0	0	6			
Life (10)	150	0	0			
				587	13	0
Sale of publications, rents, etc.				56	1	2
Friends of Tasmanian Museum—Half cost of R. M. Johnston lecture and conversazione				11	14	10
Transferred from Life Membership Fund to forward to Northern Branch				15	0	0
Transferred from funds for books, 1947				44	9	11
A. N. Lewis Memorial Fund—Interest, etc.				7	12	11
				£722	11	10

PAYMENTS.

	£	s.	d.
Balance from last Account	13	0	7
Salaries	188	18	1
Group insurance	4	8	0
Light and power	55	19	4
Library	74	3	2
Stationery	28	7	1
Miscellaneous	38	18	7
Postage—Papers and Proceedings	15	10	3
Northern Branch	32	12	6
Insurance	9	12	7
Petty cash (in hand 1s. 1d.)	45	13	1
Refund to Life Membership Fund, Mackaness brochure, etc.	41	14	6
Refund—A. N. Lewis Fund—Interest, etc.	7	12	11
Transferred to Life Membership Fund	150	0	0
	706	19	8
Balance to next Account	15	12	2
	£722	11	10

H J. EXLEY, Hon. Auditor.
28th February, 1949.

WILFRID H. HUDSPETH, Vice-President.
D. COLBRON PEARSE, Hon. Secretary.

ROYAL SOCIETY FUNDS.

Statement of Balances for Year ended 31st December, 1948.

	£	s.	d.
Reserve Account	0	14	8
Life Membership Fees	292	10	3
Clive Lord Memorial Fund (£200)	10	3	4
R. M. Johnston Memorial (£232)	7	19	8
Morton Allport Memorial Fund (£200)	7	16	0
A. H. Clarke Bequest (£100)	1	14	10
Milligan Bequest (£150)	5	8	4
A. N. Lewis Memorial Fund (Total Fund, £232 17s. 11d.—Invest. Commonwealth Loan, £200)	18	4	5

Abstract of Proceedings

2ND MARCH, 1948

Annual Meeting

The Annual Meeting was held in the Society's Room, Tasmanian Museum. His Excellency the Governor, President of the Society, presided.

The following Office-bearers were elected for 1948:—Dr. W. L. Crowther was elected Vice-President for two years in the place of Mr. L. Cerutty, who retired under Rule 12; Honorary Secretary, Dr. J. Pearson; Assistant Honorary Secretary, Mr. D. C. Pearse; Honorary Treasurer, Mr. S. Angel; Honorary Auditor, Mr. H. J. Exley.

The following were elected members of the Council for 1948:—Mr. A. L. Meston was elected for three years in the place of Dr. W. L. Crowther, who retired under Rule 21. Mr. J. W. C. Wyett, who had been appointed for one year in 1947, in the place of Professor H. D. Gordon, was elected for a further term of three years.

The following were elected members of the Society:—Ordinary Members: Miss E. Bailey, Miss M. G. Rouse, Miss C. Shepherd, Archdeacon J. R. Norman, Mr. R. Pocock, Dr. W. W. Wilson.

Dr. D. G. Osborne, Lecturer in Geology, University of Sydney, delivered an illustrated lecture entitled 'New Zealand (Scenic, Geologic, and Seismologic)'.

6TH APRIL, 1948

A meeting was held in the Society's Room. Mr. W. H. Hudspeth, Vice-President, presided.

The following were elected members of the Society:—Ordinary Members: Dr. Ida Birchall, Dr. M. C. Devenish-Mears, Mrs. M. Gallia, Mrs. M. J. Swan, Mr. K. B. Allen, Mr. I. G. Anderson, Professor H. N. Barber, Mr. F. D. Cumbrae-Stewart, Hon. R. K. Green, Mr. E. E. Guiler, Mr. R. M. Gunn, Dr. C. Loftus Hills, Mr. E. D. B. Innes, Dr. T. James, Mr. A. C. Richmond, Mr. A. Roche, Mr. C. J. S. Somerset, Mr. H. Turner, Mr. D. D. von Bibra.

Professor H. N. Barber delivered an illustrated lecture entitled 'Genes and Plasmagenes'.

Archdeacon Atkinson presented specimens of *Hedycarya augustifolia.* A. Cunn. 'Djelwuck' or 'Austral mulberry'. Family *Monimiaceae*, collected in Lancaster's bush and on the banks of Narracoopa Creek, towards the eastern shore of King Island, in October, 1947. He requested that these specimens should be kept at the Herbarium.

30TH APRIL, 1948

A meeting was held in the Society's Room. His Excellency the Governor, President of the Society, presided.

The following were elected members of the Socity:—Ordinary Members: Mr. A. M. D. Hewer, Mr. A. C. Thompson, Dr. D. H. Waterworth; Associate Members: Mr. J. E. S. Alwyn, Mr. J. R. Wall.

The President presented the R. M. Johnston Memorial Medal to Professor T. Griffith Taylor, Professor of Geography at the University of Toronto.

Professor Taylor then delivered the R. M. Johnston Memorial Lecture entitled 'Racial Migrations and Relations', illustrated by lantern slides, of which the following is an abstract:—

We are met here to-night to keep green the memory of a very distinguished Tasmanian citizen, R. M. Johnston, who died in 1918 after devoting many years to research in several fields of science. He contributed numerous memoirs on biological and geological problems to the records of the Royal Society, and when I was engaged in pioneer investigations in the geography of this State, his large volume on the 'Geology of Tasmania' was a very important source for my study. I also feel it a special honour to follow the man to whom I owe my early training in geology and geography—Sir Edgeworth David—who gave the first Johnston Memorial Lecture in 1923.

Ever since 1918 I have been more interested in the Patterns of Human Distribution than in any other branch of scientific research. The lengthy monograph by the American biologist, W. D. Matthew, published in New York in 1915, entitled 'Climate and Evolution' deals with the evolution of the mammals. Matthew laid great stress on *Charting the data of distribution* as a key to evolution, and I felt that primitive man who lived long before civilization began, must necessarily obey the same laws of distribution.

I plotted on world-maps all the anthropometric data which was available. Among these data were those dealing with head indices, facial indices, hair waves, nasal shape, skin colour, stature, etc. etc. They gave patterns very like Matthew's zones for the even-toed and odd-toed mammals with which biologists are familiar.

These data were plotted on maps with a special projection, much like that used by Matthew; so that the essential *World Pattern* was emphasised. It consists of a central area or core in southern Asia from which project three 'World Peninsulas'. These are Eur-Africa, Austral-Asia, and the Americas. The nine major environments of the world (from Ice-cap to Selva) are repeated three times on each side of the equator; and this Pattern is an important feature in the theory of Race Migration and Classification which I have been developing for thirty years. (This aspect of Racial geography is fully developed in my book 'Environment Race and Migration', Toronto, Chicago & Oxford University Presses, 1937.)

Let us now consider the pattern in the racial distribution which has developed in the migrations in the Pacific regions of the World. To understand these, we must consider in some detail the very varied environments, including topography and climate. These have changed notably during the time of the Racial migrations—which I believe to have taken several hundred thousand years. We must ignore the complications due to the mixing of peoples in the last 450 years due to large scale emigration across the seas; and consider the zones of races which characterised the world in pre-Columbian times.

Why and how did early man migrate? I do not think he moved willingly from his native haunts. Primitive tribes have quite definite rules as to trespass, as any student of our aboriginals knows. He knew nothing of the outer world and was in general fearful of the unknown. The major factor which drove him away from his favourite haunts was Climatic Change; just as the major migrations of our time have been due to famines, droughts and other features of Climatic change. In the several hundred thousand years involved in our study there occurred the world wide phenomena known as the Riss Ice Age, the warmer Interglacial, and the various fluctuating climates of the Warm Ice Age and of Post-placial Periods. Very convincing evidence has been demonstrated in Scandinavia as to climatic changes there in the last 20,000 years; and as to their effects on the zones of forests and on the movements of early man. (These are discussed fully in my book 'Environment and Nation', Toronto, Chicago & Oxford Universities, 1936.) We may be sure that similar correlations of climate and man will be revealed when detailed research in other lands has been carried out.

A second important element in race migration is the topography. Almost all movements on a large scale seem to have followed well defined 'Corridors'. In our corner of the Old World one may instance the Khyber Pass into North-West India. Down this poured a dozen invasions of the rich plains of Hindustan during historic times. It was equally the gateway in prehistoric times. Into China the broad-head Alpines poured by way of the Jade Gate—which was the north-east corner of the high plateau of Tibet. Every incursion into Australia made use of those 'Stepping stones' which we call the East Indian Islands. During the coldest phases of the Ice Ages we are reasonably sure that a sub-continent (known as Sunda Land) occupied this area. It was drowned by the thaw-waters when the ice-caps melted. (See Fig. 5 in my book 'Our Evolving Civilization an Introduction of Geo-pacifics', Toronto & Oxford Universities, 1947.)

To understand the pattern which develops after a number of migrations along such a Corridor; I use the analogy of a Playing-Field. We may assume it lies on a main road, but a mile or two out of the city. When a notable game is imminent we may picture schoolboys moving out in the morning along the main road (the 'Corridor') and for an hour or so roaming over the vast level attractive site of the playing field. About noon the proletariat stream into the field, and the boys climb into trees around the margins of the field, while the proletariat—after moving freely around, occupy the poorest seats. Next come the capitalists by the same route and occupy the best seats. Finally come the cream of our civilization, the cricketers, etc. (who incidentally receive far more attention from the public than do Einstein or Rutherford). They occupy the most attractive area in the region—the central level plain.

If we study any very extensive human migrations we find much this distribution whether it be into India, into Australia or into America. The least attractive areas—such as the deserts or mountains, or dense jungles ultimately receive the earliest and feeblest tribes. They have been 'pushed to the wall' in the struggle for existence. Here inevitably occur the pygmy Negritoes, as I have demonstrated in many maps and diagrams. The process as regards the other races is best shown in America—where the migrations were mostly within the last 20,000 years. Here the 'corridor' was clearly along the eastern margin of the Young Mountains; and here accordingly we still find the recently arrived broad-head tribes of Amerinds. In my opinion they are the last-developed and biologically the most advanced. They include the Shoshone, Navaho Aztec, Inca and Araucarian groups.

Pushed out into inhospitable corners we find the narrow-headed tribes notably the Eskimo in Greenland. In unattractive forests in Bolivia some Qurungua tribes are, in my opinion, actually kin to the Australian aboriginal. I think they represent a preglacial migration from Asia long before any Amerinds reached America.

In our own part of the world we find Negritoes in the rugged mountains of New Guinea—whereas more advanced Oceanic Negroes occupy the plains of the Fly River. It is likely that the marginal island of Tasmania preserved Negritoes until 1875 just as they occur in the mountains of the marginal Philippine Islands to-day. The Australian aboriginal entered Australia probably during the Warm Glacial period, when Sunda Land gave him a rather ready access into the southern Continent.

The Polynesian migrations are rather complex. They occurred relatively late in history, after boat-building was well understood by folk living in the south-east of Asia. I have seen many culture-patterns in south China which recall those of Polynesia. They were marginal peoples, kin to the broad-heads in Western Europe, and were displaced by the still later broad-heads whom we call Chinese.

They sailed far into the Pacific where the earlier Oceanic Negroes had never ventured. It is probable that these later migrations consisted of a broad-head aristocracy, together with many narrow-headed serfs. Hence we do not find pure racial stocks in any islands. However, Easter Island folk have less of the broad-head element than tribes in Hawaii or North Island (N.Z.); while the broadest heads are found in Samoa and Tahiti—which are usually accepted as the most cultured groups of the Polynesians.

In conclusion it has long been clear to me that a general appreciation of the biological migrations and patterns which I have just tried to demonstrate would do much to diminish race-prejudice. All over the world intolerance is due to ignorance. The world is shrinking so rapidly that all races are becoming our neighbours. We must learn to live in harmony with other peoples and races; and cultural geography (especially when directed towards world-peace as in the newer branch called Geo-pacifics) seems to me to be the most practical method of propaganda towards that much-to-be-desired objective.

1st June, 1948

A meeting was held in the Society's Room. Mr. W. H. Hudspeth, Vice-President, presided.

The following were elected members of the Society:—Ordinary Members: Miss D. J. R. Bell, Mr. M. H. F. Bennett, Mr. H. V. Biggins, Mr. F. F. Fairthorne, Jnr., Mr. E. F. Fricke, Mr. W. J. Gellie, Mr. G. T. H. Harris, Mr. M. H. Hurburgh, Mr. C. C. Lawrence, Dr. W. K. McIntyre, Mr. E. J. Martyn, Mr. E. J. Pitchford, Sir Gordon Rolph, Mr. M. H. Rosenberg, Mr. E. T. Smith, Mr. G. H. Stancombe, Mr. F. L. von Stieglitz, Dr. L. Hardy Wilson; Associate Members: Miss N. J. Purcell, Mr. C. H. Johnson, Mr. A. G. Lyne, Mr. A. J. McIntosh, Mr. G. B. Sharman.

On behalf of the Royal Society of New South Wales, the Chairman presented to Dr. J. C. Jaeger the Walter Burfitt Prize and Medal for 1947. This award was made for Dr. Jaeger's outstanding work in mathematics during the previous three years.

Professor C. D. Hardie delivered a lecture entitled 'Science and Perception'.

6TH JULY, 1948

A meeting was held in the Society's Room. Mr. W. H. Hudspeth, Vice-President, presided.

The following were elected members of the Society:—Ordinary Members: Mrs. E. Glasson, Mrs. M. C. F. McAfee, Mr. M. B. Amos, Mr. J. Bradley, Mr. F. F. Fairthorne, Mr. T. G. Johnston, Mr. H. Vernon Jones, Dr. R. A. Lewis, Dr. H. Spencer Roberts, Mr. R. H. Youl, Dr. Robert Wall; Associate Members: Mr. W. M. Crosby, Mr. R. H. Cruickshank, Mr. N. P. Tilley, Mr. K. R. Walker.

Mr. K. M. Dallas delivered a lecture entitled 'The Political Economy of Van Diemen's Land', of which the following is an abstract:—

> The outstanding fact about Van Diemen's Land before 1850 is the high level of prosperity enjoyed by comparison with other Australian colonies. The evidence of capital expansion, of trade, of wage-levels and living standards especially before the depression of the Forties is in striking contrast to its comparative poverty in later periods. The high productivity was certainly due in part to the continued investment of capital by new immigrants and some absentee investors but this too was partly due to the Imperial subsidy on account of the convict establishment. This provided a constant demand for produce, at fixed prices with no risk of bad debts and the primary income from the 'invisible export' of food, materials and services generated secondary incomes of large volume in a community where unused resources were plentiful.
>
> Its importance in the growth of the colony came from its size, from its certainty and because it supplied ample volume of liquid wealth, which was the basis of internal finance and exchange, and was also a reserve of international money, as good as gold, and available for the finance of import trade with Mauritius and Canton for which there was no acceptable export commodity.
>
> Moreover its fluctuations were opposite to those of other exports, declining in good years when numbers of convicts assigned were large and increasing in lean years when they were returned to Government gangs. Thus it provided a stabilising influence unique in colonial development. The absence of bank failures during the Forties depression is due to this stability. Melville estimates that in one year of that period it was as high as £400,000.
>
> The continued attempts at economy by the Imperial Government were largely unsuccessful and the increasing convict population meant that the subvention increased right to the last years of transportation and the decline in prosperity in the Sixties is largely due to the end of this golden rain.
>
> Transportation thus evolved into a subsidised emigration as the pastoral and agricultural industries were stimulated by the demand for wool in England and for food here. The convict working class were better off than the wage-earners of contemporary Britain, and the regulation of rations, clothes and wages was the true origin of Australian wage regulation. The earnings of all were determined by prescribed conditions for assigned service. The convicts outside the penal settlements were 90 per cent of the total and were an average sample of the skills then known in Britain. The opportunities to achieve economic independence, even while legally bound, were many and make the term 'Slavery', as used by Forsyth in 'Governor Arthur's Convict System' merely rhetorical, especially when compared with 'free' employment as it then was in Britain.
>
> The history of the convict period needs to be rewritten in the light of modern economic theory on the relations between Investment and National Income.

5TH AUGUST, 1948

A special meeting was held in the Society's Room. Mr. W. H. Hudspeth, Vice-President, presided.

Rule 43 was amended to read as follows:—

"A sum of £20 may be paid at any time by a Member as a Life Membership Fee, provided however that any Ordinary Member wishing to become a Life

Member shall first pay any arrears which may be due in respect of his subscription as an Ordinary Member. Such Life Membership Fees shall be invested or at the discretion of the Council be expended only upon permanent improvement of the rooms occupied by or upon the general equipment of the Society. Each Life Member shall receive a copy of the Papers and Proceedings for the year in which his subscription as a Life Member is paid and for each subsequent year without further payment.

5th August, 1948

A meeting was held in the Society's Room. Mr. W. H. Hudspeth, Vice-President, presided.

The following were elected members of the Society:—Ordinary Members: Miss H. Bayly, Miss D. M. Harvey, Mr. A. D. MacKinnon; Associate Member: Mr. I. F. Reynolds.

Mr. T. D. Raphael delivered an illustrated lecture entitled 'Bees—The Production of Pedigree Stock'.

Though the advances made by the animal geneticist and stock breeder are well known, the public does not generally recognise the intensive work and immense strides that have been made in the breeding of bees.

The main objects of workers in this field has been to produce a strain of heavy honey producers, vigorous and adaptable, free from a pronounced tendency to swarm and in temperament docile and easy to handle. Many varieties of bees have been utilised by the apiarist, including Italians, Carniolans, Caucasian, Ligurian and Cyprian in addition to the common Black and many less known types.

The inmates of a normal hive in summer consist of one queen, the mother of the whole colony, several hundred drones and 50,000 or more workers. The queen is the only fully developed female and can lay up to 3000 eggs in a day, the drones are the males and the workers are undeveloped females. It therefore follows that one has only to change the queen to change the whole hive, and queen breeding is, in consequence, one of the most important branches of specialised apiculture.

When a few queens only are required, this can be simply done by dequeening the selected colony when the bees take immediate steps to replace the loss. But as the breeder requires possibly hundreds in a season, other methods must be devised. Commercial practices now generally centre round a three stage process, a separate hive (or section of a composite hive) for starting the queen cells, a hive for feeding the developing larvae and a third from which the young queens are mated. Special conditions have to be created within the hives to stimulate the bees to their individual tasks and considerable skill and ingenuity is required. As bees mate in the air, control of the male parentage is difficult to obtain and a considerable percentage of mismating sometimes occurs. The choice of isolated districts or islands where bees of other strains do not occur, the breeding of large numbers of drones of the desired type and the controlling and concentration of drone flight, are the methods by which crossing has been reduced to a minimum, or even sometimes eliminated. However, during the last two years a technique for the artificial insemination of queen bees has been evolved in America and following further experimental work it is hoped in the near future to perfect a practical and commercial system which will perhaps revolutionise present methods and result in great advances in the genetical side. Anaesthetisation of the young queens with carbon dioxide as a means of inducing early egg production is another advance in this field.

Mr. Angel exhibited a painted aboriginal skull from Northern Australia. This was one of a number of skulls bequeathed to the Museum by the late Howard Amos. The skull was originally given to the Reverend Gillmore of Swansea, while he was a padre in the Army stationed in Arnheim Land in Northern Australia, by one of the natives there. Only two mainland tribes have this type of decoration and it shows the New Guinea influence.

7th September, 1948

A meeting was held in the Society's Room. Dr. W. L. Crowther, Vice-President, presided.

The following were elected members of the Society:—Ordinary Members: Mr. A. K. Caris, Mr. W. P. Holman, Mr. W. C. Morris; Associate Member: Miss E. M. Smith.

The Chairman announced that the following documents, which formed part of the Lefroy Bequest, had been presented to the Society by the Scott Polar Research Institute, England:—

1. Address to Sir John Franklin on his appointment to the governorship of Van Diemen's Land, signed by citizens of Westbury and Launceston.
2. Address to Sir John Franklin on his resignation of the governorship of Van Diemen's Land, signed by the landholders, magistrates and others of the northern part of the island.
3. Resolution of sympathy with Lady Franklin by the Legislative Council of Van Diemen's Land, 1852.
4. Address to Lady Franklin from the Tasmanian subscribers to her private search expedition, 1852, with an analysis of the list and details of the sums contributed.
5. Resolution in the Tasmanian House of Assembly of thanks to Lady Franklin for her gift of Franklin Island, 1868.

Dr. C. Loftus Hills delivered an illustrated lecture entitled 'Geological Research in Tasmania', of which the following is an abstract:—

The subject is approached from the angle of 'adaptation to environment'. It is pointed out that the rise of all civilisations has been the acceptance of a challenge of a new environment and adaptation to it. How has Tasmania answered the challenge of her land surface and climate? The question is answered by a review of the progress of hydro-electric development, mineral exploration and geological research.

The existing close co-ordination of engineering and geological science by the Hydro-Electric Commission is a credit to all concerned.

The history of mineral exploration in Western Tasmania is traced from Philosper Smith's discovery of Mt. Bischoff in 1871, Sprent's discovery of tin at Heemskirk in 1876, Long and Monk's discovery of silver-lead at Zeehan in 1882, Lynch, McDonough and Karlsen's finding of Mt. Lyell in 1881 and 1883, to McDonald's discovery of Rosebery in 1893, and that of Tullah by Innes in 1897. These discoveries were the foundation of the winning of £100,000,000 of new wealth up to the present time.

It is then shown how the work of successive geologists in Tasmania was related to these pioneering discoveries and the developments that ensued from them. The development of geological knowledge is traced from Charles Gould in the 1860's, R. M. Johnston in the 1870's and 1880's, Montgomery in 1890's, Waller in the early 1900's, Twelvetrees 1900-1920, Ward 1907-1912, Loftus-Hills 1913-1923, Arndel Lewis 1923-1943, to the present application of modern techniques with which are actively concerned Professor Carey, Dr. Loftus-Hills, the Hydro-Electric Commission, the Mines Department, North and South Broken Hill under Dr. Garretty and the Electrolytic Zinc Company under Mr. Graham Hall. A tribute is paid to the valuable contributions of amateur workers of the past; in addition to R. M. Johnston and Arndel Lewis, the names of Thomas Stephens, E. G. Hogg, Trety Noetling, W. F. Petterd and R. C. Stecht are mentioned.

It is emphasised that geological research in Tasmania is really only yet in its early stages. Work done up to the present is incomplete. Existing geological maps are subject to continuous review, adjustment and elaboration. This is illustrated by lantern slide of the evolution of the geologic structure map of Zeehan from 1903 to 1948 and the economic significance of this is pointed out.

It is shown that the present geological research in relation to mineral exploration is based on an expectation of results in from 2-5 years. But effective and efficient adaptation to environment demands a start on a plan of long-dated mineral exploration, designed to locate completely hidden ore deposits of which there is no sign at the surface, which must form the basis of mining operations 25-50 years from now. This will demand geologic research of the highest order in structure and plutonics, steadily applied throughout the years ahead of us.

8TH OCTOBER. 1948

A meeting was held in the Society's Room. Mr. W. L. Crowther, Vice-President, presiding.

The following were elected members of the Society:—Ordinary Members: Mr. E. L. Bailey, Mr. A. R. Ellis, Mr. Wm. Hart, Rev. J. Jones, Mr. E. R. Pretyman, Mr. A. F. Ryan; Associate Member: Mr. M. M. Hodgson.

Mr. W. H. Hudspeth delivered an illustrated lecture entitled 'The Rise and Fall of Chas. Swanston of the Derwent Bank'. (See p. 1.) The original Deed of Settlement of the Derwent Bank, which had been lent by Mrs. C. N. Atkins, was exhibited.

2ND NOVEMBER, 1948

A meeting was held in the Society's Room. Dr. W. L. Crowther, Vice-President,

The following were elected members of the Society:—Miss M. E. Chapman, Mrs. I. Conybeare Hervey, Mrs. A. K. Wettenhall.

The following papers which had been submitted for publication in the Society's Journal were tabled, and it was agreed to submit them to the Standing Committee:—

Tasmanian Littoral Spiders, by V. V. Hickman. (See page 31.)

Some Tasmanian Opiliones, by V. V. Hickman.

Neonatal Length as a Linear Function of Adult Length in Cetacea, by E. O. G. Scott. (See page 75.)

Tasman's Landing Places, by A. L. Meston.

New Species of Astacilla from Tasmanian Waters, by E. R. Guiler. (See page 45.)

The Vegetation of Mt. Field National Park, by Miss W. Curtis.

A Revised Description of Dolichotera macalpini Nicoll 1914, by P. W. Crowcroft.

Mr. G. K. Meldrum delived an illustrated lecture entitled 'Clover and Infertility in Sheep'.

Northern Branch

Annual Report for 1948

Membership of the Branch increased considerably during the year, from four life members and thirty-five ordinary members to nine life members and fifty-seven ordinary members.

During the year reports were prepared by the Secretary on biological survey and historical research. Proposals for the latter were discussed at a conference in Launceston under the chairmanship of Sir John Morris, the parent Society being represented by Dr. W. L. Crowther. Sir John Morris agreed to go into the possibility of the appointment of an Archivist and later advised that the Government had agreed to make the appointment.

Meetings

27TH FEBRUARY, 1948

A meeting was held at the Museum, Mr. F. Smithies presiding.

Dr. T. Levring, Director of the Marine Botanical Institute, Goteborg, and Assistant Professor, University of Goteberg, lectured on 'Submarine daylight and its effect upon seaweed life'. He described his own researches which are principally concerned with the problem of how seaweeds can make use of sunlight for their growth even though it is diminished in quality as a result of differential absorption and scattering in its passage through the sea-water, and pointed out that the changes which take place in the composition of the light are of great importance in the life of seaweeds, the occurrence of seaweeds of different pigment classes at different depths being associated with this.

21ST APRIL, 1948

Annual General Meeting.—The Annual General Meeting was held at the Museum, Mr. F. Smithies presiding.

The Annual Report and Balance-sheet for 1947 were adopted.

The following Office-bearers were elected:—

Chairman: Mr. J. E. Heritage, in place of Mr. F. Smithies, who retired under the rules.

Vice-Chairman: Mr. Gilbert McKinlay, in place of Mr. J. E. Heritage, who had been elected Chairman.

Members of Council: Hon. R. K. Green, F. Smithies (1948 only), and K. R. von Stieglitz in place of T. Doe and J. R. Forward, who retired under the rules and Gilbert McKinlay, who had been elected Vice-Chairman.

Hon. Secretary-Treasurer: Mr. N. J. B. Plomley.

A paper was given by Mr. K. R. von Stieglitz, entitled 'Some Notes on Paterson's Plains, its Pioneers and Early Life'.

In introducing the Speaker, the Chairman, Mr. Heritage, pointed out the importance of historical work being undertaken in Tasmania without further delay and said the Branch would encourage such work in the future, together with research in Tasmanian geology, biology and ethnology. He said that the work of the amateur was complementary to that of the professional and in Tasmania must provide the nucleus to carry on studies in each branch.

Mr. von Stieglitz dealt with the early history of Paterson's Plains, as St. Leonards with the area including Breadalbane, Franklin Village, Elphin and part of the White Hills was known originally. His reconstruction of the lives of the pioneers showed the difficulties with which they had to contend. Agriculture was at first unsuccessful because local conditions presented many problems and no trained farm workers were available. Crude huts were the only dwellings until as late as about 1825 because skilled building labour was not sent to the Colony,

but retained in New South Wales. Bushranging was rife, an outcome of the convict system and the economic difficulties of the young colony. He related many anecdotes concerning the pioneers and incidents of the times.

17TH JUNE, 1948

A public meeting was held in the Public Library Hall, Mr. J. E. Heritage presiding.

Mr. A. W. Knight, Hydro-Electric Commissioner, gave a lecture on 'Hydro-Electric Developments in Tasmania'. Mr. Knight outlined the general principles and requirements for the development of hydro-electric power, and discussed the utilisation of such power sources in Tasmania He showed how additional sources would be incorporated into the existing system. In commenting on power requirements in the Launceston area, he said that a power scheme with an installed capacity of 60,000 horsepower would be constructed on the South Esk at Trevallyn to provide for the needs of local industry.

The lecture was illustrated by a series of diagrams and photographs and at its conclusion a colour film was shown of the hydro-electric undertakings.

21ST JULY, 1948

A meeting was held at the Museum, Mr. J. E. Heritage presiding.

Mrs. G. E. Perrin lectured on 'Plant Life in Tasmanian Seas'. The first reviewed the work of botanists who had contributed to a knowledge of the Tasmanian marine algae from the time of the early expeditions to the present, among them La Billiardiere, Robert Brown, Ronald Gunn, William Harvey, Mrs. Louisa Meredith and A. H. S. Lucas.

Mrs. Perrin said that of more than 1500 species of seaweeds recorded from the Australian coasts, about 500 species occur in Tasmanian waters, where three species of marine phanerograms are also found. She said that seaweeds grow in the waters of the continental shelf (to a depth of 25 fathoms) and form a very important constituent of the life there; certain reef building forms also occur, thus contributing to the structure of the places in which they live.

Mrs. Perrin then went on to describe methods of collecting and preserving seaweeds. She said that the plants could be collected either in storm wrack, or by wading at low tide, or dredging; to preserve them, they should be washed in fresh water, floated on to a paper mount and pressed and dried with frequent changes of the drying cloths and papers.

The lecturer finally described some of the commercial uses of seaweeds: as fertiliser, and in the manufacture of agar, alginates and many other products. She said that the quantities of marine algae available in certain areas are enormous; growth at Tamar Heads, for example had been noted as much as 18 feet in three months.

At supper after the meeting, fruit jellies were served prepared with agar from *Gracilaria lichnoides* collected at Tamar Heads.

10TH SEPTEMBER, 1948

A meeting was held at the Museum, Mr. F. Smithies presiding.

Mr. Maurice Blackburn, M.Sc., Research Officer, Council for Scientific and Industrial Research, gave an illustrated lecture on 'Sea fisheries research, with special reference to Australia'. Describing the methods of fisheries research, Mr. Blackburn said that population studies, based on sampling, were the most

important means of studying the fish crop. Australia was producing now about 70,C00,000 lb. of fish per annum, but this represented only about two per cent of the world fish catch.

The lecturer said there were three ways of increasing fish production:—

(1) Initating *new* fisheries;

(2) Taking the *optimum* catch, i.e., the most that can be taken year after year without depleting the population; and

(3) Increasing the productivity of the environment.

Mr. Blackburn then went on to deal with each of these aspects of fisheries research in detail. He pointed out that such work was only beginning in Australia and much remained to be done. Of the three lines of attack, the first two were of use in sea fisheries; it was not generally practicable to increase the productivity of the marine environment although this may be successful in enclosed waters.

22ND NOVEMBER, 1948

A meeting was held in the Museum, Sir John Morris presided.

Dr. W. E. L. H. Crowther gave an illustrated talk entitled ' Some account of early Tasmanian Sealing and Whaling '. Dr. Crowther first commented upon the biology of whales and showed how the habit of the Southern Right Whale in visiting the coast of Van Diemen's Land for calving permitted the establishment of bay whaling. He said that the fishery was so profitable that in the late thirties and early forties of last century there were as many as forty leases for bay whaling around our coasts, and as many as fifty ships on the register at Hobart.

After a time the whales avoided the shores close to original whaling camps and had to be hunted further afield. Tasmanian ships were among those visiting the New Zealand grounds (vide McNab) and were responsible for the first settlements on the southern coast of Victoria.

Whale oil and whalebone were both important articles of commerce, the oil being used in the manufacture of candles. With the discovery of kerosene the industry declined rapidly, so that Tasmanian whaling had virtually ceased by the seventies.

Dr. Crowther concluded his lecture with a series of slides showing the old whaling ships and scenes of Tasmanian whaling.

Office-bearers, 1948

Chairman: J. E. Heritage, C.M.G., LL.B. (1948, 1949).

Vice-Chairman: Gilbert McKinlay (1948, 1949).

Council: C. Craig, M.B., M.S., F.R.A.C.S. (1948); Hon. R. K. Green, M.L.C., LL.B. (1948, 1949); F. Smithies, O.B.E. (1948); K. R. von Stieglitz (1948, 1949).

Hon. Secretary-Treasurer: N. J. B. Plomley, M.Sc. (1949).

NORTHERN BRANCH.

Statement of Accounts at 28th February, 1949.

Receipts.	£	s.	d.	Expenditure.	£	s.	d.	£	s.	d.
Balance at 1st March, 1948	27	17	4	Balance at 28th February, 1949—						
Subscriptions	66	8	0	Cash in bank	35	11	6			
Bank interest	0	4	7	Petty cash in hand	3	0	0			
								38	11	6
				Expenditure—						
				Lectures	10	16	0			
				Library	9	16	6			
				Postage and stationery	8	19	3			
				Petty cash	1	6	8			
				Miscellaneous	25	0	0			
								55	18	5
	£94	9	11					£94	9	11

H. H Pimblett, Government Printer, Tasmania